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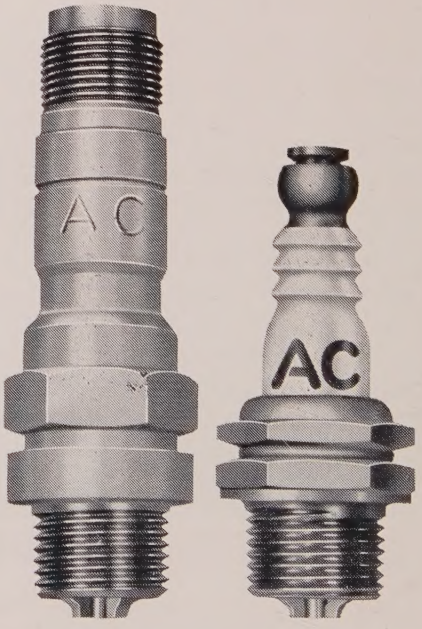

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Plug at right—AC A-88.

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industry notes . . .

Scandinavian Airlines System (SAS) is lanning to use jets on its "top of the orld" polar flights by 1960. When it does, assengers can have breakfast in Copenagen and a coffee break in Los Angeles, wo hours later by the clock. Actual flight me, of course, will be 11 hours but the estbound passengers will gain nine hours ecause of the time difference between openhagen and Los Angeles. SAS has rdered 14 Douglas DC-7C's which will cut ie time of the present trip (about 24 ours) by seven hours, and the jets will ut another six hours off that time. In SAS' rst year of polar operations, they comleted 100% of all flights; recorded better nan 90% on-time arrivals; and flew a total f 29,661, 858 passenger miles.

The USAF and Republic Aviation have nnounced the first flight of the F-105A upersonic fighter-bomber at Edwards AFB, alif. Initial flight was made by experiiental test pilot Russell M. (Rusty) Roth bout one month ahead of schedule. The ight lasted 45 minutes. The "A" model is quipped with a Pratt & Whitney J-57.

The New York Port Authority has anounced it will begin construction of a 50-room, $2,500,000 hotel on a 10-acre site t New York International Airport. The hotel will be operated by the Knott Hotel Corp., and is expected to be completed by July, 1957. It will be located north of the Federal Building, and services will include a restaurant, coffee shop, bar and cocktail lounge.

■ HERTZ Rent-A-Car System has established automobile rental service at O'Hare Field, Chicago's new airport which was officially opened in Oct., and also has been awarded a concession at Miami International Airport which, according to Hertz officials, will probably produce revenues as high as $2,800,000 the first year, and $3,250,000 the second. Two other firms also have been granted concession contracts at the Miami airport.

■ Air France has purchased 12 French commercial jet aircraft, the *Caravelle* SE-210, first of which are to be delivered to Air France in the latter part of 1958. Deliveries will continue through 1959 and 1960. Air France plans to use the *Caravelle* for medium-range flights on routes throughout Europe and the Middle East. For long-range flight on the transatlantic route, Air France is negotiating for jet aircraft with both Boeing and Douglas Aircraft. The *Caravelle* is powered by Rolls Royce *Avon* engines developing 21,000 pounds thrust.

■ General Dynamics Corporation and Bristol Aeroplane Co., Ltd. have announced progress toward long-term collaboration of their aviation interests. First step is work on a joint specification for a new, exceptionally long-range turboprop transport. This airplane is expected to be in the 500-mph class, and is designed around four Bristol BE25 turboprop engines. The intention of the three companies involved in the program, Bristol, Convair, and Canadair, is that the aircraft and engines shall be produced on both sides of the Atlantic.

■ New thrust-measuring instruments, which will give jet pilots a ready index to the thrust being put out by the engines of their airplanes, have been developed to Boeing specifications by two of its sub-contractors. These instruments will be installed on Boeing B-52 heavy bombers now in production for the USAF. Designed to increase the efficiency of long-range bombers and jet transports and to simplify long-range cruise control, the instruments are made by Minneapolis-Honeywell Regulator Co. and AiResearch Manufacturing Co. The instruments measure and indicate the ratio of engine turbine exhaust pressure to engine inlet pressure. The computation is similar to that of Machmeters which measure aircraft speed in relation to the speed of sound by measuring pressure ratios.

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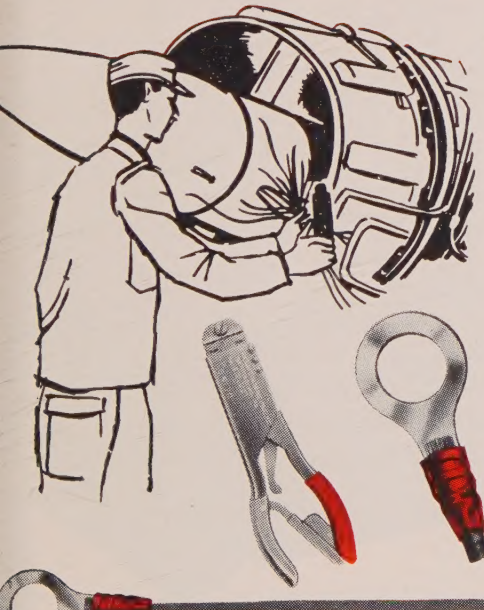

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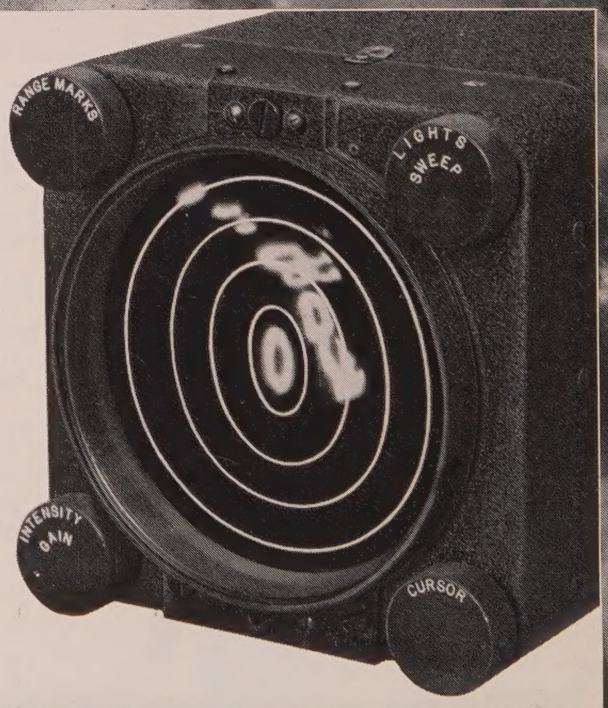

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ERSONNEL

J. C. Garrett, president and founder of he Garrett Corporation, was elected chair- ıan of the board. **W. C. Whitehead,** ormerly executive vice president of the rm, was elected president.

Albert G. Noble, Admiral, USN, Ret., as been elected a vice president of Vitro Corporation. He also was elected to Vitro's oard of directors.

George M. Bunker, president of The Iartin Co., was elected to serve as presi- ent of RIAS, Inc., a new subsidiary com- any. **Welcome W. Bender** was elected ice president; **William L. Lucas,** secre- ary-treasurer and resident agent; and **Carl R. Uhlig,** controller. RIAS, Inc. has een formed to conduct science research.

Dr. Edward C. Creutz, noted physicist, as been appointed director of research of General Atomic Division of General Dy- amics Corporation, and director of the ivision's laboratory for pure and applied cience.

David R. Anderson recently was named ice president-controller of Pratt & Whit- ey Aircraft Company.

Richard S. Mitchell, manager of the Guided Missiles Range Division of Pan American World Airways, has been elected Vice President, Guided Missiles Div.

John H. Clemson, general traffic man- ger and a veteran of 26 years with Trans World Airlines, recently was elected Vice President of TWA's expanded Passenger Service Department.

Arthur J. Fallon was named Chief of he Air Terminal Properties Division in the Aviation Department of the Port of New York Authority.

Charles T. Roelke has been named ex- cutive assistant to William P. Gwinn, eneral manager of Pratt & Whitney.

Vice Adm. Charles F. Coe, USN (Ret.), has been named Assistant to the Vice President, Engineering and Military Relations at Ryan Aeronautical.

Harold H. McIntosh recently was laced in charge of missile projects by the Goodyear Aircraft Corp. **Lloyd R. Well- er** has been appointed district field repre- entative, Dallas, Texas, for Goodyear.

Robert Chase has been named to super- ise engineering work on AC Spark Plug's ilitary production job at Flint. **William McBride** succeeds Chase as T-38 product ngineer. **Leonard E. A. Batz** has been amed to head a new design and standards ection, and **Theo A. Bartlett** has been amed to supervise a new radar develop- ent group. **Gene L. Fisher** has been laced on special assignment in connection ith new developments, and **Lyle D. Filkins** succeeds Fisher as test engineer for AC Spark Plug Corp.

Louis B. Zambon has been appointed anager of engineering for the Jet Engine ept., General Electric.

Marion Maxfield was named Assistant irector of Customer Relations of Fairchild ngine and Airplane Corporation.

Dr. W. L. Barrow recently was ap- pointed vice president for research and development, Sperry Gyroscope. **George A. Richroath** was named vice president for manufacturing, while **Dr. L. L. Wheeler** was named chief engineer, and **Samuel Agabian,** works manager of Sperry.

John C. Goodell, formerly Assistant to the President, Scott Aviation Corp., has been named to a new post, Aircraft Products Manager.

AERO CALENDAR

Jan. 9, 10—Reliability and Quality Control symposium—electronics, sponsored by IRE, Hotel Statler, Washington, D.C.

Jan. 9-13—SAE Annual Meeting, Sheraton-Cadillac Hotel and Statler Hotel, Detroit.

Jan. 19-21—National Simulation Conference, sponsored by Dallas and Fort Worth Chapters of IRE, Dallas, Tex.

Mar. 17-24—Second Annual Miami-Cuba Air Cruise, sponsored by Florida Aero Club, Miami.

April 22-26—American Association of Airport Executives annual business meeting and convention, Hotel Carter, Cleveland.

Royal AMPHIBIAN NEWS

Notes on America's outstanding utility amphibian for business flying and charter service operation

ROYAL GULL FIRST FOREIGN AIRCRAFT TO BE AWARDED CAA TYPE CERTIFICATE

Another highlight in aviation progress became history when Mr. W. Henry Weeks, Chief of CAA Aircraft Engineering handed Type Certificate of Airworthiness No. 813 to Dr. A. Piaggio. Dr. Piaggio received this certificate for the Royal Gull, a new twin-engine, five-place, gull-wing amphibian which is being assembled and equipped in this country by the Royal Aircraft Corporation, a subsidiary of Kearney & Trecker Corp., Milwaukee.

In welcoming the Royal Gull to the American fleet of executive aircraft, Mr. Weeks cited its good performance and skilled workmanship. He said, "The Royal Gull should be popular with all who fly it . . . and I speak from personal experience as I have enjoyed the gratification of flying it."

W. Henry Weeks (left) makes presentation to Dr. A. Piaggio

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Leo Yoder's Aircraft Sales and Brokerage Co., Long Beach, Cal., an associate distributor of Vest Aircraft and Finance Co., Denver, will handle Royal Gull sales on the West Coast. Photo shows Aircraft Sales' pilot accepting keys for new Royal Gull from Max Black, Royal Aircraft's general manager.

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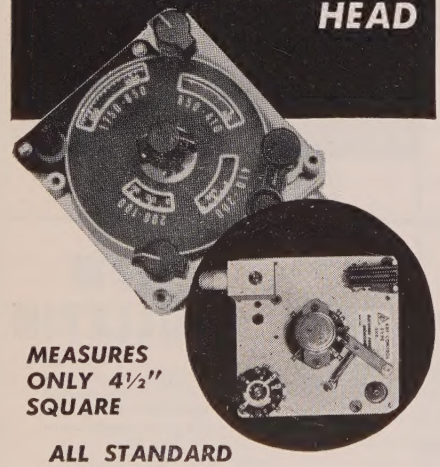

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Skyways

The Magazine of Flight Operations

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FOUNDED BY J. FRED HENRY, 1942

EDITOR & PUBLISHER
Mrs. J. Fred Henry

MANAGING EDITOR
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Herbert O. Fisher—Flight Evaluations

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SKYWAYS is the authorized publication of the National Business Aircraft Association.

BPA Member Business Publications Audit of Circulation, Inc

VOLUME 15, NUMBER 1

SKYWAYS is published monthly by Henry Publishing Co., 122 East 42nd St., New York, N.Y. Printed in the U. S. A. Single copy; 50c. Subscription Prices. U. S., Possessions, Canada and Pan Am. Union, $9.00 for 3 years, $7.00 for 2 years, $4.00 for 1 year; all other countries add $1.50 per year for postage. Please give title, position and company connection when subscribing. Six weeks required for address changes (give both old and new). Manuscripts, drawings, other material must be accompanied by stamped, self-addressed envelope. SKYWAYS is not responsible for unsolicited materials. Accepted as controlled circulation publication at Bristol, Conn. Copyright 1956 by Henry Publishing Company. The following publications are combined with SKYWAYS; Air News, Flying Sportsman and Airways Traveler. All rights to these names reserved by Henry Publishing Co.

WASHINGTON REPORT

by Albert D. Hughes

Quarles Clears Dispersal Policy

Pentagon sources interpret the Department of Defense's recent industrial dispersal directive as an effort to bring the problem into focus so that removal of plants and facilities from target areas may not become unduly emphasized over other important considerations.

Thus, the directive is interpreted as a "stand still" on the dispersal policy announced earlier in the year by DOD. It would mean, in the case of Boeing Airplane Co., for instance, that the Seattle firm can go ahead with the location of its missile plant in the interior West (Boeing's own facility at Wichita seems likely), but could take a long look at costs, worker dislocations, and delivery delays that would certainly occur if any of its existing facilities were dispersed.

This clarification of policy by Secretary of the Air Force Donald A. Quarles in a talk before the Los Angeles Rotary Club went far to assuage the aviation industry, especially on the West Coast. It has been concerned over just how far the Defense Dept. meant to go with dispersal.

DOD's directive, "Recognizing the obstacles to maximum dispersal, such as cost, social dislocation in existing areas of population, delay of vital defense production and development," set this criteria:

1. When multiple sources for an item of material or development are practical, dispersal will be a key factor in selection of additional sources. This principle will be applied in the case of sub-contract work.

2. Dispersal will be one of the prime considerations in location of new facilities, particularly when furnished at government expense.

3. All facilities in being will be maintained as required to avoid excessive cost and resulting social dislocation occurring in the abandonment of existing production facilities. Where feasible, existing facilities will be used before new facilities are constructed.

4. Timely delivery should be weighed against the urgency for dispersal.

5. Avoidance of over-concentration of critical defense facilities shall be the objective, consistent with the above policies.

Navy to Test Westinghouse Engine

Westinghouse Electric Corp., capital opinion estimates, is in a position to make re-entry into the jet-engine business.

Rear Admiral James S. Russell, chief of Navy's Bureau of Aeronautics, in a letter to G. A. Price, Westinghouse president, has signified the service's acceptance for test and evaluation of Westinghouse's new lightweight turbo-jet aircraft engine.

Outcome of these tests will determine whether the Navy gives Westinghouse a production order for the new engine. The Navy evaluation is bound to be more severe, Pentagon sources intimate, inasmuch as the service and Westinghouse both recently have been the subject of Congressional inquiry into procurement practices, and possibly more hearings are in store.

Details and performance of the new engine, called PD-33 by Westinghouse and J-54 by the Navy, were not disclosed. Westinghouse developed the engine with its own funds in co-operation with Rolls Royce. Two engines have been made available to the Navy by the company for testing at the Navy's recently dedicated Air Turbine Test Station, Trenton, N. J.

Carriers May Challenge CAB

Talk in capital airline quarters is that the scheduled carriers may challenge the CAB's large irregular-carrier decision. Some airline thinking regards the CAB decision as "outrageous" in granting status to the irregulars, even as one of its biggest groups, North American Airlines, is under threat of certificate revocation. (North American was not made a party to the current decision pending a court ruling on the Board's powers in this matter.)

On the other hand it is pointed out that the new "Supplemental Carriers," as they are called, will have to get in better shape, insofar as equipment is concerned, to compete effectively with the scheduled airlines. The question is, can a cross-country flight in a slower DC-4 or C-46 compare with a faster *Constellation* or DC-6 flight in shorter time and at only slightly more fare?

The supplemental carriers believe that their investment position is bettered by the CAB decision. They would be a ready market, no doubt, for DC-6's, Connies, Convairs and Martins, if and when the scheduled airlines begin to get rid of them for their turboprop and turbojet fleets. But this will not happen for three or four years. Some bold equipment planning seems called for by the supplemental carriers if they really want to be in a competive position, one scheduled airline source said.

Convertible Congress Reports

Col. William Zinns, Chief, Rotary Wing Liaison, ARDC, Wright Field, estimated that it would require a six- to seven- year period of development to produce a convertiplane upon which the service could put its stamp of approval.

Reporting Air Force progress in convertible aircraft projects, Colonel Zinns emphasized to the recent Third Convertible Congress in Philadelphia that this proposed development assumed an immediate start on accelerated research, plus unlimited funds and with stated military requirements for the vehicle.

He disclosed that McDonnell's XV-1 convertiplane, an unloaded rotor type, is nearing 20 hours of flight testing as well as its Air Force evaluation. Zinns said that the XV-1 has flown at speeds of more than 160 knots, as confirmed by a film following his talk which showed a DC-3 flying "all out" to keep up with the XV-1.

Zinns said that Bell Aircraft's tilting-rotor convertiplane had made its first hovering flight but has not made a forward flight. Both Hiller and Sikorsky were disclosed to be working on retractible-rotor types.

The ARDC officer said that an accident halted test flights on Transcendental Aircraft Corp.'s tilting rotor convertiplane, the only privately developed design that the Air Force has looked into. Up to that point, the Glen Riddle, Pa. company's prototype had ticked off 25 flight hours and had been 70% "converted" to forward flight.

Comdr. C. A. Wharton, chief of Naval Operations in charge of anti-submarine warfare, emphasized that the sea service has requirements that a convertiplane might fulfill, rather than requirements for a convertiplane. This was taken to mean that the Navy presently prefers Convair's XFY-1 vertical take-off fighter, the "pogo stick," as the current solution to its vertical-lift requirements. Wharton pointed out that a convertiplane would satisfy the Navy's need for faster rescue and for wider search operations. In amphibious assault operations, convertiplanes could move men and equipment more rapidly to beachheads, he said.

One of the highlights of the meeting was a description by James F. "Skeets" Coleman, Convair test pilot, of flights in the VTO plane. Coleman characterized the XFY-1 as an aircraft of stable flight ability with hovering versatility at ground level equal to a helicopter. He said the plane can yaw, slip and fly on its back, once the pilot accustoms himself to the unusual operating position. Flying the "pogo stick" was no more difficult than an ordinary plane, he said, and in fixed-wing flight the vertical-lift plane handles like a fighter.

Col. John Rowan, Headquarters, Army, G-3, told the meeting that the Army may not need a convertiplane but possibly a fixed-wing aircraft with shorter take-off and landing ability.

pilot's report

Boeing 707 Jet Stratoliner

by Herb Fisher

Chief, Aviation Development Division,
The Port of New York Authority

TANKER *version of the 707 is equipped with tail boom which drops down for in-flight refueling. Whether or not commercial jets will be refueled in flight is not known at this time*

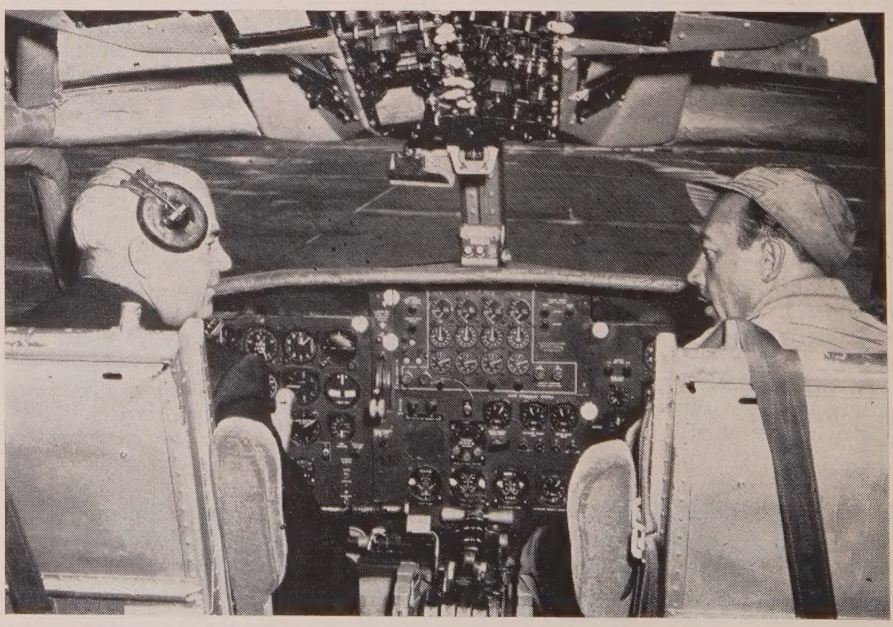
Using Boeing's accomplishments with its 707 as a yardstick, it's safe to predict that the first generation of U. S. turbojet transports will establish new high levels of performance. For the growing millions of air travelers this type of aircraft should write a new concept in transportation, far different from any other we have ever experienced. There is one basic problem, even though difficult, which must be solved. That is reduction of external jet engine sound levels at their source.

The Port of New York Authority has taken the leadership over the past several years in attacking the problem of aircraft noise as it affects 8 to 12 million people who live near the New York-New Jersey metropolitan airports, namely; New York International Airport, La Guardia Airport, Newark Airport, and Teterboro Airport. Through our dealings with civic groups, local governments, and various other organizations and individuals among our airport neighbors in the New York metropolitan area, we have become convinced that the future development of commercial aviation in this area is inseparably linked with the noise problem. Unless all future aircraft can operate in airport vicinities within a reasonable noise level acceptable to the public, the success of the air-transportation industry may be seriously jeopardized. It, therefore, may not be possible for such future aircraft to operate into many of the world's leading airports.

My trip to Seattle to fly the 707 had a two-fold purpose. First, it made possible a long-deferred reunion with A. M. (Tex) Johnston, Boeing's chief of flight test, who served as test pilot for Bell Aircraft in Niagara Falls while I held down a similar post with Curtiss-Wright during World War II in Buffalo. Secondly, my first-hand look at Boeing's new jet transport was in line with the Port of New York Authority's long-standing policy of staying on top of all new developments in the transportation field.

Because of the Port's tremendous interest in aviation, good management dictates that we look ahead to tomorrow and the day after, rather than to sit back and wait to see what may happen. The Authority is vitally interested in how these new aircraft will integrate themselves into the universal problems of 1) noise, 2) runway lengths, 3) ramp handling, 4) fueling problems, 5) passenger loading 6) acceptance rates, 7) high-speed turnoffs from runways, and many other factors in daily operations.

Aircraft of the 707 Class, scheduled to become operational in 1959 and 1960, will be able to carry more passengers faster, farther, at higher altitudes and in greater comfort than any previous airline equipment. They will make possible a marked reduction in air-travel time schedules and, it is hoped, result in greater operating economy. And from a pilot's standpoint they will generally be easier to



PILOT-AUTHOR *Herb Fisher sits in lefthand seat, with Tex Johnston in right, just before take-off on test flight. The 707 recently flew Seattle to Washington, D.C. in 3 hrs., 58 mins.*

BOEING *test pilot Tex Johnston (right) shows Herb Fisher (center), with Boeing's chief of technical staff, George Schairer, the details of the 707's outboard jet pod that houses the Pratt & Whitney J57 unit*

fly than propeller-driven aircraft.

My first flight in the 707 was made with our good friends Pat Patterson, president of United Air Lines; Jack Herlihy, vice president for engineering; and Ken Gordon, Boeing's sales engineer. With Tex at the controls and Pat, Jack and I grouped right back of him, the 707 (somewhat below full gross weight) took a short run, immediately accelerated to 300 knots indicated and then held that airspeed up through 35,000 feet. My records show we did it in about 10 minutes. I am sure that Pat and Jack were as impressed as I was with that performance.

Having been classified as one of these things called a test pilot for many years (low-income glamour), the following are my personal observations based on a turn at the controls of the 707 prototype and on a couple of subsequent flights, plus a review of the data compiled by Boeing in the 19-month period since its maiden flight. This sleek liner entered the flight-test phase of development July 15, 1954. The first production airplane, to be known as the *Jet Stratoliner*, will be slightly longer, will have a higher gross weight than the prototype, and advanced-type P&W J57 engines will provide improved cruising speed.

To the pilots who will fly the *Jet Stratoliner*, I have this to report: "You ain't seen nothing until you've seen the cockpit simplicity of this aircraft." Although I did not count them all, it is supposed to have 115 fewer powerplant controls and instruments than the *Stratocruiser* and it sure seemed like it.

It's a "no-sweat" job for just two men—pilot and copilot—and with a flight engineer aboard those two will really have it made. Tex Johnston, congenial host for my visit, claims the 707 is easier to handle than the old DC-3. Without debating that point, I can report that Boeing's first turbojet transport has control and cockpit simplicity unattainable in four-engine piston aircraft.

Much of the simplicity stems from the jet engines. Gone are the propeller synchronizer, supercharger, cowl-flap, mixture, carburetor-heat, propeller-pitch controls and many banks of instruments. And good riddance, I say.

The jet engine control is, as Tex likes to point out, as uncomplicated as a broom handle. I guess it's a good comparison, because that control is a single lever mechanically connected to a hydro-mechanical regulator on the engine. When you push it open, the engine accelerates. When you pull it back, the engine slows down. The fuel-air ratio takes care of itself. And, as you know, there is practically no warm-up period. You're ready to go when you start the engines.

JET 707, *shown here over Mount Rainier, offers airline passengers speeds of 550 and 600 mph at 35,000 feet. Non-stop Los Angeles to N. Y. would take 4 hours, 15 min.*

Boeing dipped into its experience with the six-jet B-47 and the eight-jet B-52 in designing this four-jet aircraft cockpit to permit all normal and emergency functions to be handled safely and conveniently by a crew of two pilots. The engineers were aware that cockpit work-load is highest in a go-around from a missed instrument approach and, since such go-arounds usually occur at the end of a flight, such incidents can be complicated by pilot fatigue. So, they figured, let's try to reduce the work-loads.

The 707 offers an increase in go-around safety, because: 1) The approach angle is controllable by speed brakes, reducing overshoot, and approach power can be maintained where rapid acceleration is needed. 2) Power can be adjusted in a single motion. There is no cowl-flap adjustment, no engine-cooling problem. 3) There is virtually no aircraft control problem. Longitudinal trim varies with speed, not power. 4) There is no propeller adjustment, no worry about overspeed or control.

Although they are designed primarily to supplement lateral control, the 707 spoilers also may be used symmetrically as speed brakes, facilitating emergency descent or correcting for high or fast approach. This use of spoilers gives the pilot a wider choice of approach angles than he now has in present-day aircraft. The net result is better control and operating safety.

The spoilers also have another useful job. On touchdown, they help to unload the wing and place greater weight on the wheels for more effective braking. This results in a good reduction in landing distance. Used as speed brakes, the spoilers also are effective in decelerating the aircraft in rough air.

For added drag, landing gear may be extended at cruising speed to reduce slow-down distance to approximately two miles. This is based on actual flight-test experiments and it contradicts theoretical analyses which suggested that excessive jet-transport slow-down distance might create new operational problems.

Pilots also will be gratified to learn that the primary flight controls are 100% manually operated. There is no power boost. With simplicity, reliability and safety as their goals, Boeing designers decided that these controls should be actuated by spring tabs connected by cable to the pilot's wheel and rudder pedals. By using internal pressure balances, they designed a system which provides low control

(*Continued on page* 34)

HERB FISHER, *who test flies and reports on new aircraft, equipment for SKYWAYS, was test pilot for Curtiss-Wright for 15 years. This photo was taken just prior to Herb's flying the Boeing 707 jet transport*

INTERNATIONAL HARVESTER'S *current business aircraft fleet consists of two DC-3's, Twin Beech based at Chicago's Midway Airport*

Customer Airlifts to Sales

by Jean H. DuBuque

Executive Director, NBAA

International Harvester Co., in its history of steady growth and progress, has successfully utilized railroads, steamships and motor trucks to conduct a world-wide business more efficiently. Naturally, as one would expect, transportation's vigorous 20th-century youngster, the airplane, eventually found a place in the company operations and has proved to be a most "useful tool" in conducting daily business affairs.

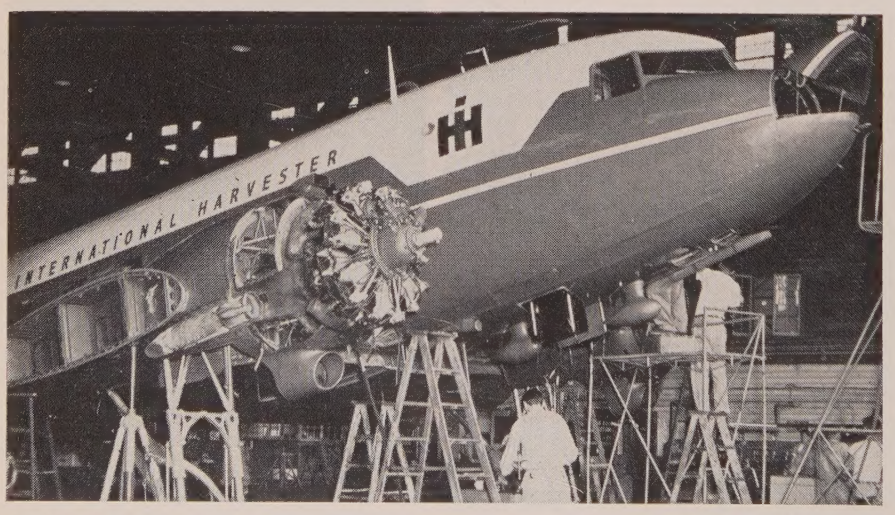
Recently, Harvester purchased another Twin-Beech, bringing to four the strength of its business fleet now based at Chicago's Midway Airport. Harvester aircraft operation has grown up in the middle of a new idea that now sparks the company-wide campaign for increased sales.

To sell farm equipment, motor trucks and industrial power equipment, Harvester salesmen must sell quality. It is the only thing a salesman really has to sell in the face of today's brisk competitive market. Harvester customers and product-users are now being flown directly to the assembly lines of various plants in different parts of the country to see for themselves that the company's salesmen aren't just giving a "sales pitch" when they describe the kind of quality their production men have long put into the machines they build.

Continuing effort to pyramid sales has turned the Harvester flight operation into a kind of mass airlift, winging regular and potential customers into the nearest plants for a first-hand "look-see."

Motor truck and industrial power users generally are busy men, deeply engrossed in complex business problems of their own, and can spare but little time away from their home operations. Harvester airplanes have turned former two-day railroad trips into five-hour flights, with tasty meals served to guest passengers in the air. Even the busiest product-user can spare that much time. For this new phase of a well-planned sales campaign, the planes have made it easier for a Texas motor-truck user to see trucks built at the Fort Wayne Works in 1955 than it was for an Iowa farmer to see tractors made at the Farmall Works in Rock Island just across the Illinois line in 1935. The plant-flight idea has become enormously popular with the customers who use Harvester's products, and the popularity of the Harvester brand has soared with the stepped-up schedules of their four sleek aircraft.

Recently, the fiftieth plane-load of Harvester motor-truck customers to visit Fort Wayne Manufacturing and Engineering facilities touched down at Baer Field some 11 miles away from the plant. A neat little Harvester bus picked up a dozen businessmen and whisked them off to a two-day round of visiting, inspection, and down-to-earth shop talk with production and engineering men.



MAJOR OVERHAUL *work on the IH DC-3's is done by Aerodex at Miami International Airport. Newest of the International Harvester aircraft is a Twin-Beech*

Altogether, about 600 passengers, each one of them an important motor-truck user, have been flown in for a Fort Wayne visit. It has proved a most profitable experience for the company as well as the guests. There was much to see and show, both in the engineering and building of trucks. The visitors had a lot to say, and Harvester management listened. Such visits culminate a job of basic selling that has borne remarkable success. In addition, vital answers were furnished to the company question, "What do you honestly think of our product?"

Airlifts of Harvester customers are almost daily converging on plants of all divisions of the company. The Industrial Power Division plays host annually to hundreds of users of earthmoving equipment, flown to Chicago from every corner of the nation. Other planeloads of guests have been and are being flown to plants in the quad-cities and elsewhere. Obviously, the purpose of the flights is to show product users the amount of effort and money put into Harvester research, design, and testing, and to highlight the daily battle of production people to keep the level of product quality as high as Harvester salesmen have always claimed it to be. In each instance, seeing has been believing. Letters written by enthusiastic visitors following their return home have confirmed that fact.

The customer airlifts also have provided a way to tell a story to important buyers of the variety of products Harvester makes in the only way the story can really be told. On a face-to-face basis, by an on-the-spot visit, Harvester has stuck to the principle that their guests "must be shown to be convinced." The company counts upon honest facts to do the convincing and they have and are doing just that.

When eight years ago International Harvester Company, like many other progressive firms, became aware of the transportation and sales advantage to be derived from the operation of a company-owned plane, they purchased a converted B-23 which was originally designed as a light military bomber. Getting off to a comparatively slow start, due to the company's lack of experience with an operation of this type, the Harvester plane (christened the "Harold F. McCormick" in honor of one of the founders of the company) soon found a permanent place in the conduct of the business. With increasing utilization, interest in the varied uses of the plane steadily mounted.

After four years of operating the B-23, it was decided that Harvester's expanded business interests justified the purchase of a second airplane, and an intensive survey was made of the various types of aircraft available to meet company needs. In the latter part of 1951, the B-23 was sold. In the interest of standardization of maintenance and operations, it was replaced by two DC-3 aircraft. A Twin Beech later was added for shorter flights with key officers and passengers to and from off-airway rural areas.

MOTOR TRUCK BUSSES *deliver International Harvester customer-guests to the Chicago airport for flight to International Harvester plants in other parts of the country*

Since 1947, Harvester airplanes have flown nearly two million accident-free miles, criss-crossed the nation countless times, ranged north to Canada as far as Arctic Labrador, and south across the Caribbean Sea to the West Indies and South America. Such flights have not always been of a passenger nature.

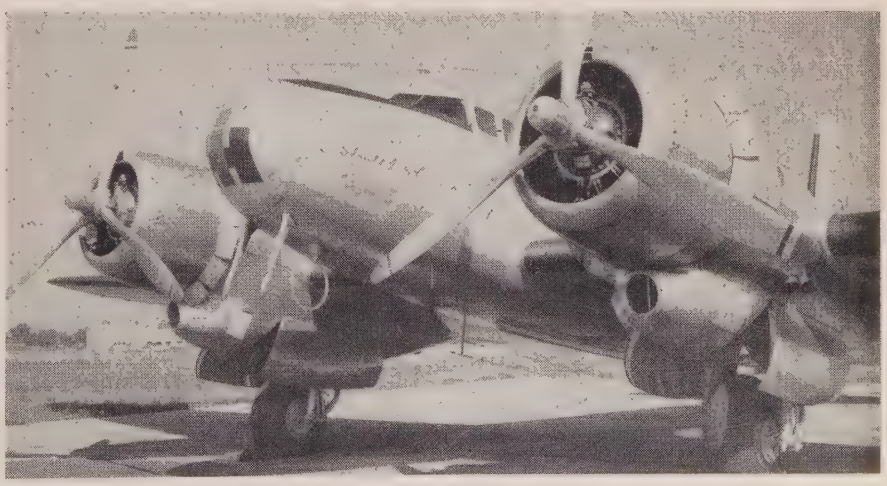
During the Korean war, when a Marine division was to be rushed to the far east, Harvester's Industrial Power Division called upon the company planes for an urgent shipment of critical spare parts to accompany the troops. In a matter of hours several tons of essential cargo were on their way to a Pacific Coast Port of Embarkation in ample time to meet the deadline.

Many times Company planes also have been used to fly high-priority cargo, sometimes constituting the only expeditious way of keeping a plant from shutting down its assembly lines. One of Harvester's Division General Managers stated that a certain trip of one of the company planes, in his opinion, more than paid the original purchase price of the plane and its entire cost of operation for a whole year.

Another advantage of the use of Harvester's larger aircraft lies in the opportunity for 10 or 12 sales engineers or other personnel to carry on business deliberation while flying on an assignment.

"Group discussions are practically impossible on a commercial plane where passengers are scattered throughout the cabin and where it is difficult for more than two persons to carry on a sustained conversation," a Harvester official said. "Consequently, travel in our company planes often eliminates the necessity for breaking up a meeting early because of having to meet airline schedules. Also it is possible to get a

(*Continued on page* 40)



INTERNATIONAL'S *first executive airplane was a B-23 purchased by the company in 1947, and named in honor of Harold F. McCormick, one of company founders*

DISCUSSION *of the problems involved in the interception of civil aircraft was held in Los Angeles. Those who participated in the meeting were (standing, left to right) Lee Flanagin, TWA; L. C. Holtan, Western Air Lines; Col. A. R. DeBolt, North American Aviation; Jack Womack, AiResearch Aviation Service; and L. P. Connick, Slick; (seated, left to right) Maj. L. C. Sadek, ADC; Lt. Col. H. W. Jensen, 437th FIS; J. R. Dettman, ATA; Gen. J. S. Marriott, Regional Administrator of CAA, who served as moderator; Col. L. J. Pardue, Flight Safety Research, USAF; Gen. C. A. Shoop, Hughes Aircraft and 146th FIW; Jack Tighe, ADC/CAA*

SKYWAYS FLIGHT OPERATIONS ROUND TABLE

Problems of Interception of Civil Aircraft

On the day of this Round Table, the Security Rules of air traffic required a flight plan if an aircraft were penetrating an ADIZ at an altitude of 4,000 feet or more and at a TAS of 160 mph or more. As of Dec. 1, changes in these regulations exempt from Security Rules only those aircraft maintaining a TAS of 110 knots or less and an altitude of 1500 feet or less above the immediate terrain. Readers should bear in mind that a few of the statements made herein are subject to some modification in light of the changes made effective Dec. 1, 1955.—Editor

Moderator Gen. J. S. Marriott *(Regional Administrator, CAA):* "By way of introducing the topic SKYWAYS has assigned us today, namely, the problems involved in the interception of civil aircraft, I have asked the military representatives to tell us the purpose of this defense set-up and the identification of civil as well as military aircraft.

"Major Sadek, would you give us some of the background of this program?"

Major Louis C. Sadek *(Air Traffic Control Officer, Hq., ADC):* "The Air Defense Command is charged with the defense of the United States. In a broad sense, this means that, the detection of unknown aircraft, identification, and destroying a target if it should be hostile, is our responsibility.

"Detection is accomplished by the use of ground equipment incorporating radar; identification is accomplished either by correlating intelligence received through land-line information, commonly referred to as flight plans, with the position of the target on radar grids or, if such intelligence is not available, identification is made through the use of interceptor aircraft.

"Fortunately, there has been no need thus far for destroying a target. However, I would like to point out that each pilot in the entire defense system has rigid rules concerning the definition of a friendly aircraft and a hostile one. The pilots do not exercise their own judgment in this respect. This is laid down as a firm policy."

Gen. Marriott: *"This brings us to the point of the interception itself.*

"Col. Jensen, as the commander of an actual defense unit up at Oxnard AFB, would you tell us who orders the intercepts?"

Col. Howard W. Jensen *(Comdr., 437th FIS):* "As you all may know, the radar net that is a part of our aircraft control and warning system normally provides the first indication of an aircraft operating in an area at

a time not expected or pre-planned. As Major Sadek pointed out, if identification cannot be made satisfactorily by correlation of flight plans, etc., the decision to scramble (to send fighters up to identify the aircraft) is made by the director at the control site. There again, very strict rules concerning the scramble of fighter-interceptor aircraft are laid down by the Air Division Commander in implementing the policies of higher headquarters.

"We get our scramble orders right from the Control Direction Center, and when we get that word, the fighters go. From there on, the fighters proceed under the direction of the ground controller throughout the mission.

"Enroute to the target, we call pertinent information back, and most of the decisions for the pilot concerning the intercept are made on the ground. The intercepting pilot, however, does have very definite and well-laid-down rules that tell him when he can make a decision on his own. If he detects a hostile act, which again is well defined, he could take it upon himself to decide what to do. Normally, however, his decisions will come from the Direction Center."

Gen. Marriott: *"Do we understand that the control station evaluates the information it has from whatever source it may come—radar, etc.—and then if the station is not satisfied that the aircraft in question is actually identified as friendly, it may or may not, depending on judgment of the situation, order a scramble?"*

Col. Jensen: "That is essentially right. We look at it this way: scrambling of the fighters is the last resort to making an identification."

Gen. Marriott: *"Then in order to avoid interception, the pilots of both military and civil aircraft should know certain rules or regulations with which they must comply. Is that true?"*

Col. Jensen: "Very definitely, sir. I think that everyone connected with this problem—the fighter and the aircraft which is subject to interception—must be aware of every detail of what he is required to do and why that requirement exists, before this system will work."

Gen. Marriott: *"How would a pilot, particularly a civilian pilot, know what he is supposed to do?*

"Jack Tighe, as the CAA representative and advisor at Air Defense Command headquarters, will you tell us this?"

Jack V. Tighe *(CAA Liaison Officer, ADC):* "Various pilot organizations have put out any number of bulletins to inform pilots of the regulations, particularly CAA Regulation 620 which prescribes the areas known as Air Defense Identification Zones where pilots are expected or actually required to file flight plans. As it stands today, penetration or going into these areas from within the U.S. below 4,000 feet does not require a flight plan." *(As of December 1, 1955, new regulations stipulate that a "flight maintaining a TAS of 110 knots or less, and an altitude of 1500 feet or less, above the immediate terrain is exempt from the Security Rules."*—Ed.

Gen. Marriott: *"You speak of penetration, what are we penetrating? I assume you are referring to the Air Defense Identification Zones, commonly called ADIZ."*

Jack Tighe: "That is correct. The Air Force, Navy and Army have a joint regulation, a counterpart of the CAA reg which prescribes the minimum requirements of the CAA regulation. However, the military requires more of its pilots than is required of civilian pilots. The main difference between the two regulations as they stand today is that the military requires its pilots to ground-file before penetrating or operating within an Air Defense Identification Zone, and the CAA regulation does not. Those regulations describe the rules for flying within the ADIZ areas. Those are legal documents as far as the military and civilian pilots are concerned." *(According to the new Security Rules, a pilot is not prohibited from filing a flight plan by radio while in the air, but ADC advises advance filing from the ground so that pilots will not be subject to possible interception for positive identification.*—Ed.)

Col. Arthur R. DeBolt: *(Ass't to the Vice Pres., North American Avia-*

ROUND TABLE PARTICIPANTS

J. S. MARRIOTT has been with CAA since 1928. He served in World War I and II, and still holds active Command Pilot rating. He is Brig. Gen. in Air Force Reserve.

LEE FLANAGIN has been with TWA since 1926. During war, he was in charge of TWA's domestic military operation for ATC; is Ass't Dir-Operations, Western Reg.

L. C. HOLTAN has been with Western Air Lines since 1937. He is graduate of Kelly Field, Texas (1931), and was on active duty at Selfridge Field, Michigan, for the USAF.

GEN. C. A. SHOOP has been member of Calif. ANG since 1933. He is former test pilot and was one of first to fly jet aircraft. He served with 55th Fighter Group.

COL. L. J. PARDUE is a West Point graduate (1938) and spent a year as student at Air War College; was assigned to Flight Safety Research, USAF, 2½ years ago.

L. P. CONNICK spent five years with the Air Force before joining Slick Airways in 1946. He presently is Slick's chief pilot of the Western Division.

COL. A. R. DeBOLT has been flying since 1932. He was separated from AF with rank of Col. after 16 years of duty. He joined North American Aviation in 1953.

JACK WOMACK flew 51 combat missions in Europe in B-24's during WW II, and participated in Korean War in A-26's. He first joined AiResearch Aviation in '48.

LT. COL. H. W. JENSEN, commander of 437th Fighter Interceptor Squadron, entered service in 1942. He organized and led "Aerojets" in 1948; went to Oxnard '53.

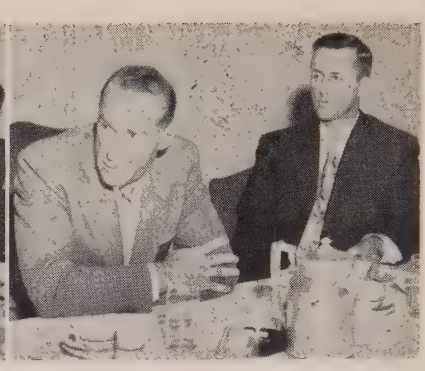
JOHN V. TIGHE, formerly with United Air Lines, joined CAA in 1936. He served with USAF during WW II; is presently Lt. Col. in USAFR; holds Com'l pilots license.

MAJ. LOUIS C. SADEK joined the military as a flight instructor in 1943; served with 35th Fighter Group in Japan, 1946, '47; and is now ATC Officer, Hq., ADC.

J. R. DETTMAN has been active in aviation since 1938; was with Capital Air Lines for three years, 11 years with the CAA; is now Regional Mgr., Air Transport Assn.

"MILITARY *requires its pilots to ground-file flight plans before flying in ADIZ," said Mr. Tighe (right), "CAA does not"*

"PRACTICE *interceptions are part of the program," Col. Jensen (center) explained, "but it is not done against civilian aircraft"*



"LARGER *numbers should be painted on the tail of civilian aircraft," agreed Jack Womack (left), "if it makes safer operation"*

tion, Inc.): "What is the reaction in the CAA's Air Traffic Control Centers to the filing of IFR flight plans under VFR conditions to simplify control within the ADIZ's? Or do they prefer DVFR plans within the ADIZ, which to me means that the control centers are still as overworked as they ever were with moving cards and keeping track of positions under VFR conditions?"

Jack Tighe: "A very heavy workload does fall upon CAA in this respect. However, we do encourage the filing of either DVFR or IFR even though that means a workload.

"As to the DVFR's or the impact of the entire Air Defense System on CAA ARTC Centers and Communications stations, the Air Force is supporting the operation financially. The Air Force requires a certain service from the CAA so they can identify these aircraft. The CAA was not manned for it and we did not have the funds. Therefore, the Air Force is picking up the tab and paying for the positions we call air-movement information sections within the Centers. Additional communications are required within the CAA system to gather this flight-movement information to pass on to the radars, and this is paid for by the Air Force."

Gen. Marriott: "*According to the CAR's which Mr. Tighe referred to, there are certain conditions under which civil pilot need not file a flight plan in order to go through an ADIZ.*

"*Mr. Dettman, what are those conditions?*"

J. R. Dettman *(Regional Manager, Air Transport Association):* "Under the current regulations, a pilot does not have to file a flight plan if he is operating below 4,000 feet above the terrain. However, if an aircraft is operating at a speed above approximately 160 mph, the ADC is interested in the flight's progress." *(New regulations stipulate 1500 feet or less, and 110 knots or less.*—Ed.)

Jack Tighe: "There is no speed restriction on civilian aircraft today. There are ADC identification criteria, but no speed requirements on the pilot."

Jay Dettman: "Under those circumstances, the regulations do not require the pilot to file a DVFR flight plan. A speed limitation, however, is going to be incorporated in the forthcoming amendment. If a plane is operating below certain true airspeeds, the ADC is not much interested in it, but above certain airspeeds the ADC is interested in it regardless of altitude." *(New regulation requires aircraft without two-way radio to file DVFR flight plan before entering or operating in an ADIZ.*—Ed)

Gen. Marriott: "*From what Jay has said, I sense there is a question here in the matter of airspeeds and whether or not the pilots file flight plans. I understand the instructions to the pilot of the intercept plane are that they use a speed criteria. Is that correct?*"

Col. Jensen: "Not exactly, sir. The pilot does not make that decision. There again, we are under the control of the Director who would make the decision based on information relayed to him by the fighter aircraft. However, I do believe the Director has some prerogative there—such as when an aircraft is flying very low and can be determined to be a light aircraft."

Gen. Marriott: "*Maybe this varies between air divisions. Major Sadek, can you tell us? I have heard that 110 knots (about 127 mph) is the rule of thumb used by the military, and if the aircraft flies faster than that, they sometimes do intercept for identification.*"

Major L. C. Sadek: "Fundamentally, that is correct. To back up just a bit, the use of the word 'judgment' in describing a director's actions infers that he has a great deal of latitude when he really does not. He has a precise criteria which he uses to de-

"INTERCEPTS *we've experienced," said L. C. Holtan (left), "have been smooth. Our only objection is they sometimes come too close"*

"AIR FORCE *and CAA meetings with pilots," declared Col. DeBolt (center), "would be excellent way of cleaning up problems"*

"DIRECTOR *has a precise criteria," explained Maj. Sadek (left), "to determine whether he orders a scramble; speed is part of it"*

termine whether or not he will order scramble action, and a part of it is this speed criterion."

Gen. Marriott: *"We have a representative of AiResearch with us who does both private and business flying. Mr. Womack, are you familiar with this speed requirement? Have you known about it or have you understood that the regulations just prescribe altitude restrictions?"*

Jack Womack (*Flight Operations Mgr., AiResearch Aviation Service*): "We have gone strictly on the altitude assumption: below 4,000 feet above the terrain. I have never heard the airspeed restriction mentioned."

Gen. Marriott: *"Jack, is an airspeed restriction actually published in the 620 regulation?"*

Jack Tighe: "No, it is not published nor is it presently a requirement of the pilot. (*New regulations now include it.*—Ed)

"The Air Defense Command would like to have all flight plans ground-filed. ADC feels it is taking some risk in accepting an air-file, and they have asked a number of times that the CAA require a ground-file flight plan in the regulations. The CAA has been opposed to this because we feel it would be putting an undue hardship on many pilots who are not in a position to ground-file. The Air Force is still entitled to its opinion, of course, since they have the responsibility of defending the United States and identifying aircraft in line with that defense. If your flight operations bring you into an ADIZ area at a pretty good rate of speed below 4,000 feet and no flight plan has been filed, ADC might find it necessary to take a look.

"In 1952, the CAA queried the Air Defense Command on why ADC aircraft intercepted when civil aircraft obviously were not in violation, that is, were below 4,000 feet on a domestic penetration—and in some cases the intercepts were made outside the ADIZ. ADC replied that a track that appears suspicious or is questionable in the opinion of ADC may be intercepted wherever it is, inside or outside an ADIZ. If an aircraft, due to speed, altitude or proximity to target, performs a maneuver such as a sudden turn toward a critical target area, ADC reported it was required to look at it. However, that does not mean the full intercept pattern must be flown. If the airplane in question is, for example, outside an ADIZ and they can identify it by friendly configuration, there is no need to come in close because it obviously is not in violation.

"The CAA was requested to tell the industry that aircraft are subject to intercept wherever they are when the pattern of flight indicates they might be suspicious. The 110 knots in the ADIZ below 4,000 feet is an identification criteria that ADC placed on its own units. The pilot is not in violation today if he goes through an ADIZ at an altitude below 4,000 feet at 200 knots (*Note new regulations.*—Ed.), but the ADC boys feel that they must look at him because it is a speed within the range of that of possible hostile aircraft. In such a case, an interceptor need not get up close to that aircraft to get his number."

Gen. Marriott: *"I would assume it is the prerogative of the Air Defense Command to do this if it is necessary to accomplish their mission. The point is, there appears to be an inconsistency between the rules of the road under which the civilian pilot is working and those under which the military pilot is working. Apparently, this has resulted in some misunderstanding.*

"Gen. Shoop, I understand that on occasions the National Guard also is brought into this intercept business."

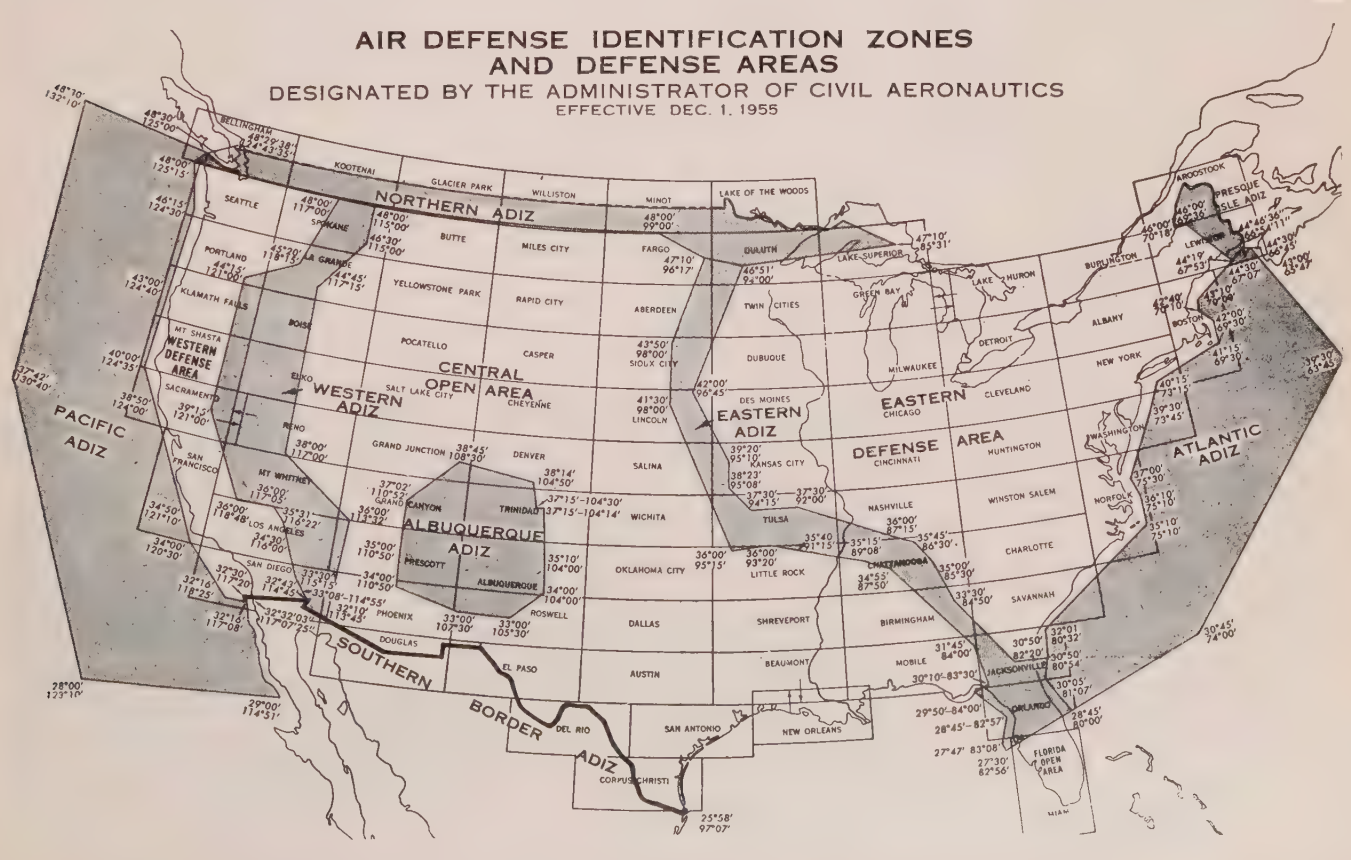
Gen. C. A. Shoop (*Dir., Flight Test, Hughes Aircraft, also 146th Fighter Intercept Wing*): "Yes, Joe, we work on the same operation plan as all the ADC squadrons. We have airplanes standing on the runway at Van Nuys and they are ready to scramble at a moment's notice. We use the same S.O.P. as the 27th Air Division."

Gen. Marriott: *"Has this difference in speed ranges caused your outfit any concern?"*

Gen. Shoop: "No, it hasn't bothered us. As Col. Jenson said, that is primarily a control function. The controller checks the speed and then he decides to scramble. The pilot probably never would know what created this decision to scramble."

Gen. Marriott: *"When you scram-*

(*Continued on page 28*)



SKYWAYS FOR BUSINESS

News Notes for Pilots, Plane Owners Operating Aircraft in the Interest of Business

BUSINESS DC-3, *utilizing two Aerojet-General 15KS rocket engines to compensate for right engine throttled at take-off, cleared 50-foot obstacle in 3,000 feet*

Two Rocket Engines Add 400 HP To 25,500-Pound Business DC-3

Fort Belvoir, Va. Aerojet-General Corporation of Azusa, Calif., recently showed spectators at Fort Belvoir how to get a 25,500-lb DC-3, with one engine completely throttled and windmilling in the highest drag condition, over a 50-foot obstacle in 3,000 feet of runway. Normal requirement under the same engine, load and wind conditions, is 5,000 feet, but two Aerojet-General rocket engines turned the trick.

The two 15KS rocket engines installed on the DC-3, each delivering 1,000 pounds thrust for 15 seconds, added the equivalent of 400 hp.

The first installation of 15KS-1,000 rocket engines on an executive airplane was made by Pacific Airmotive on a Lockheed PV-1 owned by the Rockwell Manufacturing Co., Pittsburgh, Pa. In a flight test of this installation, at 110°F and an airplane gross of 30,000 pounds, Chief Pilot Joe McClure first cut back to 70% of full power, without rocket assistance. But with a further cut-back to 50% of full power, simulating engine failure, the PV's flight path could not be maintained. On the second flight, McClure cut back to 50% of full power at take-off and simultaneously started his two 15KS rocket engines. The PV-1 accelerated from 110 to 150 mph in six seconds and gained 200 feet more altitude in the 15 seconds of rocket thrust than it had gained at 70% of primary engine thrust.

The PV-1 rocket engine installation is the internally mounted type; the DC-3 installation was externally mounted. The Aerojet-General 15KS is the only rocket engine carrying CAA certification for use as emergency standby power on business and executive aircraft.

As a result of these recent demonstrations, rocket engine installations are planned for some 25 business aircraft, including the D18S, the *Lodestar*, B-25, B-26 and other PV-1's and DC-3's.

Four-Place Mooney Mark 20 Gets CAA Type Certificate

Kerrville, Tex. Mooney Aircraft, Inc., recently received its CAA Approved Type Certificate for the four-place Mark 20 and already has delivered its #4 production airplane.

A so-called "big brother" to the well-known Mooney *Mite*, the Mark 20 was specifically designed for the flying businessman who wants an airplane that is easy to fly and that offers good cruise speed at economical per-mile costs. Powered by 150-hp Lycoming engine, the Mark 20 is reported to operate at 6.1 cents per mile and to offer more than one mile per hour per horsepower, or 165 mph at 75% of power at 6,000 feet.

The Mark 20 features a modified laminar-flow wing, large-area, manually operated three-position flaps for short-field operation, steerable nosewheel and fully retractable landing gear. Twin exhaust augmentor tubes improve engine cooling and add speed through its jet effect.

Standard equipment includes the Hartzell constant speed prop, a Narco Superhomer (VHF transceiver and omni), stall-warning indicator, electric turn-and-back, rate-of-climb, sensitive altimeter, manifold pressure gauge, cylinder head temperature gauge, and a complete electrical system which includes lights and an auxiliary fuel pump.

The Mark 20 has a wingspan of 35 feet; a gross weight of 2,450 pounds; useful load of 1,115 pounds; maximum cruise at full gross, at 7,000 feet and 75% power, of 170 mph; economy cruise, at 60% power, of 150 mph, a range of from 890 miles to 1,000 miles, depending on cruise setting, and a landing speed of 50 mph.

List price of the new four-placer is $12,500 FAF Kerrville.

MOONEY MARK 20, *recently type certificated, is four-placer that cruises at 170 mph at 7,000 feet at 75% power; has range of 1,000 miles and landing speed of 50 mph*

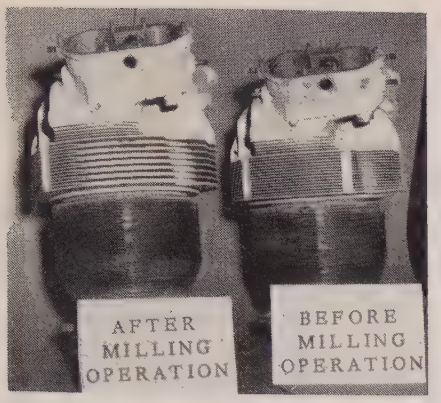
Learstar Gross Weight Increased to 24,000 Lbs

Santa Monica, Calif. The CAA recently approved the *Learstar's* increase in gross take-off weight to 24,000 pounds. Its previous gross was 22,500 pounds. Structural modifications which made this increase possible were confined to a beefing up of certain areas, principally portions of the main landing gear assemblies, portions of the main spar, landing gear and spar attach points as well as outer wing panel attach points.

These modifications have been incorporated in recently delivered *Learstars*, and modification of early *Learstars* to the new structural specifications is now in the process. These changes also permit an increase in landing weight from 20,400 pounds to 21,500 pounds.

CAA Approves Durham R-1820 Engine Cylinder Modification

Woodside, N. Y. A low-cost, long-lasting modification which eliminates "hot spots" and improves the operational characteristics of the R-1820 HC-series engine cylin-



DURHAM-*developed modification eliminates "hot spots" in R-1820 HC engines. Re-working also improves operational characteristics; is similar to HD series*

ders, proposed by Durham Aircraft's Engine Overhaul Division, has been approved by the CAA. This modification procedure was developed by Durham during three years of overhaul experience on more than 650 engines of this type. The re-working alters the old-type cylinder so that it is similar to the newer HD- and HE-series cylinders. It costs about 12% of the usual replacement costs. Solid shrunk-in seats replace the buttress-thread seats and the head-finning configuration is changed to produce the desired effect.

New Low-Cost Hangars Offered Private, Business Aircraft

Worcester, Mass. A new-type, low-cost hangar for business planes is now available in mass-production quantities. Designed and built by The Quad Corporation, the hangar is in the shape of a four-leaf clover and holds four planes in separate stalls, each with its own door opening. These clover-leaf Quad hangars are available in two sizes. The Standard holds aircraft up to the size of the twin Piper *Apache;* the Super Quad holds planes up to the Beech 18S. Special Quads also are available for the DC-3, the Convair, etc.

Full details of the hangars may be obtained from The Quad Corporation, 340 Main Street, Worcester 8, Mass.

Qualitron Named DME Test, Service Center

Ambler, Pa. Qualitron, Inc., located at Lockheed Air Terminal, Burbank, Calif., has been named a Factory-Approved DME service center by National Aeronautical Corp.

To meet the requirements, Qualitron has installed all the necessary test and servicing equipment to serve Narco Distance Measuring Equipment users.

Camair Gross Weight Upped to 4,323 Pounds

Galveston, Tex. Camair has received approval of a gross weight increase for the Camair 480, twin-engine business plane. The aircraft is now approved for operation at 4,323 lbs., giving a useful load of 1,373 lbs. Prior approved GW was 3,930 lbs.

. . . . in the business hangar

Ray Higgins and Gene Regar brought Sun Oil's Super-92 DC-3 to Engine Works, a division of Remmert-Werner, St. Louis, for a double engine change.

The North American Life and Casualty Company of Minneapolis, recently bought a D18S from Wiplinger Aircraft Service.

W. E. Waver, pilot and personnel manager for Layne Company, brought his Twin Beech C-18 to Horton and Horton, Fort Worth, for a custom interior and the certified removal of the aft bulkhead. Home base for Layne's C-18 is Memphis, Tenn.

C. D. MacLean, pilot for Williamson and Dickie Company's PV-1, brought the company plane to Southwest Airmotive for 100 hour inspection. Home base of operation for the PV-1 is Fort Worth, Texas.

Shell Petroleum Company, Ltd., recently placed an order for its second deHavilland *Heron.* DeHavilland is giving the Shell *Heron* its special executive treatment, and when the aircraft goes into operation, it will be one of Britain's most attractive business planes.

Long Bell Lumber Company, Kansas City, Mo., has had its *Aero Commander* 560A at Aerotron Radio Company, Tulsa, for installation of a Flite-Tronics CA-1 audio amplifier.

Rowan Drilling Company, Fort Worth, recently had its Grumman G44A *Widgeon* overhauled and modified to the *Super Widgeon* by Pan Air Corporation, New Orleans. New Orleans is home base for Rowan's *Super Widgeon* and its pilot is Pete Beebe. P. H. Carney is Rowan's chief pilot and NBAA representative.

Arthur Godfrey's DC-3 has been in the L. B. Smith hangar for a new paint job. "Mister G" heads up Arthur Godfrey Enterprises, Inc., and is his organization's NBAA representative.

Superior Oil Company, Houston, Texas, has contracted with Dallas Aero Service for overhaul of the company's Grumman *Mallard,* gas tank reseal and new interior. DAS also is designing and installing a new auxiliary fuel system in Superior's A-26.

Capt. George Bevins and his copilot, Skip Neely, recently flew the George Brewster Company's business DC-3 back to home base at Bogata, N. J. The -3 had been in the shop at L. B. Smith, Miami, for new interior and picture window installation. Capt. Bevins is Brewster's NBAA representative.

Illini Airlines, air taxi operator from Sterling, Ill., recently purchased two deHavilland *Doves* from Dallas Aero Service. Dallas Aero is installing new interiors in both aircraft.

Republic Natural Gas Company's G44A *Super Widgeon* is back in operation after a new paint job and 1,000 hour check at Pan Air Corporation, New Orleans. Gus Maurer is Republic's pilot.

Phil deSalvo, pilot for Hollymatic Corporation's Twin Beech, brought the company plane to Dallas and Southwest Airmotive for minor maintenance, oil change, etc. Home base for the D18 is Chicago.

Marshall-Wells Company, Duluth, Minn., has bought a Lockheed *Lodestar.* The acceptance and 100 hour check on the newly acquired Lockheed were run by Wiplinger Aircraft Service, St. Paul.

The first of four Tennessee Gas and Transmission Company's aircraft, a DC-3, is in the shop at Dallas Aero Service for installation of Bendix radar. When this job is completed, the second -3 and two -26's will go in for the installation. Tony Zuma is TGT's NBAA representative.

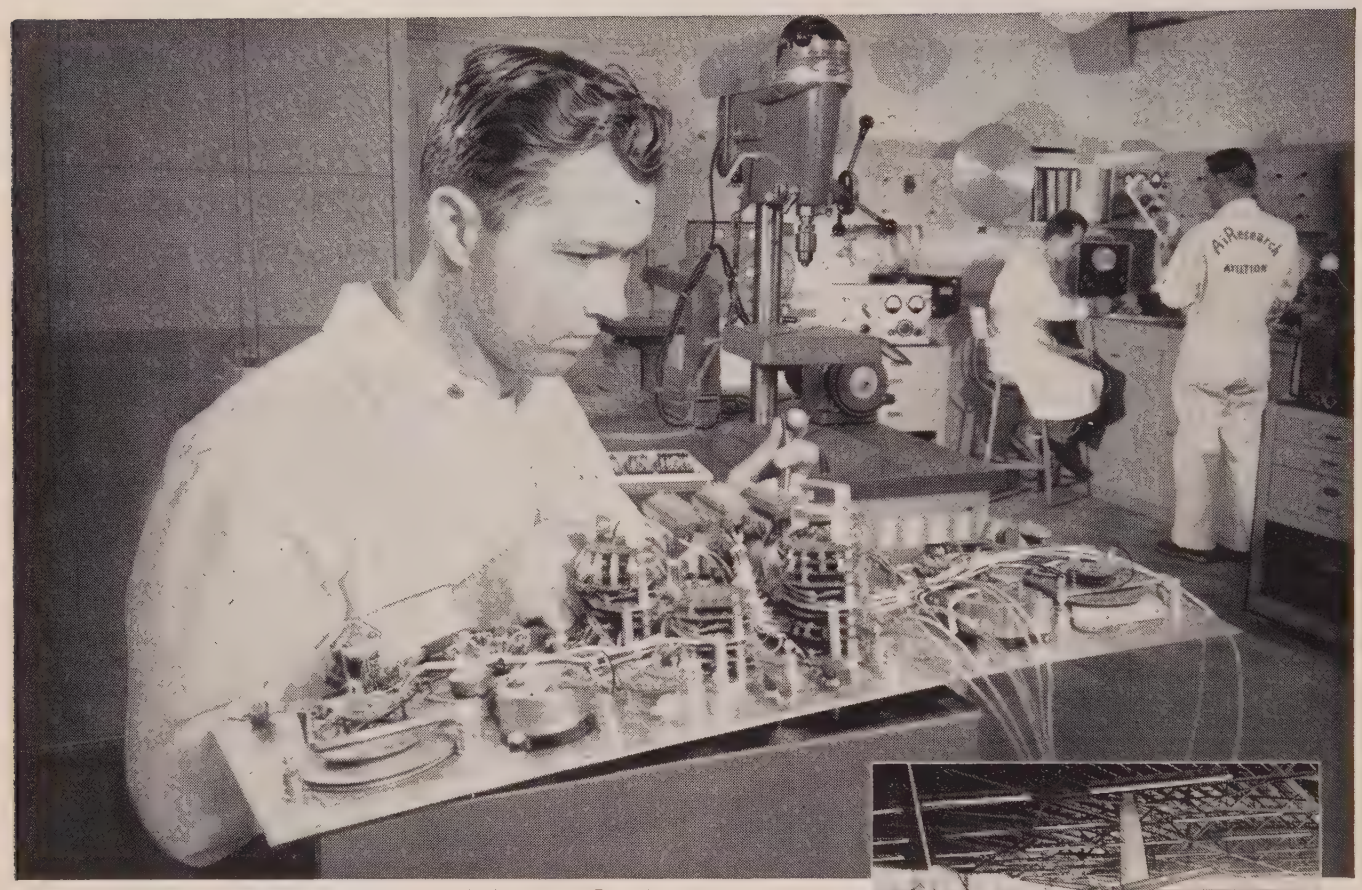
Horton and Horton recently completed a new custom-designed interior for Superior Oil Company's *Navion.* Larry Jewell brought the *Navion* to Fort Worth from its home base, Midland, Texas.

Gaylord Corporation has had its DC-3 at Remmert-Werner for installation of picture windows just aft of the pilots' sliding windows, for more pilot visibility. While this work was being done, a double engine change was made and a Bendix radar installed. Lee Dorrance is his company's NBAA representative.

Raoul Castro and his copilot, Nick Rezich, of International Harvester, stopped at L. B. Smith Aircraft while on a recent business trip to Florida. Capt. Bob Drattz and his copilot, Alex Hasse, also of IH, brought the company Twin Beech to LBS.

Modification work and interior overhaul have been completed on Phillip's Petroleum's DC-3 by Dallas Aero Service. The -3 is base at Bartlesville.

Now! Finest radio and electronics service center for business aircraft!



VISIT OUR SHOPS at the International Airport in Los Angeles. Meet our unsurpassed staff of electronics engineers and FCC technicians, all thoroughly experienced in aeronautical communications. Examine the finest equipment and test facilities in the country.

No expense has been spared at the new AiResearch Aviation Service electronics center to provide business aircraft with the kind of complete service facilities previously only available to the airlines.

This department is completely set up to handle radio sales, engineering, design and installation, as well as the service and repair of aeronautical communications and navigational equipment. We are CAA certified for Class I and Class II.

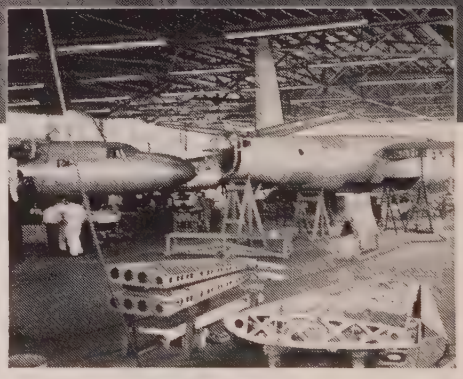
A complete line of electronic equipment and parts is stocked for immediate delivery. Brands include COLLINS —BENDIX—WILCOX—RCA—SPERRY—ARC.

SPECIALISTS IN AIRCRAFT SERVICE AND CONVERSION

THE GARRETT CORPORATION

AiResearch Aviation Service Division

Los Angeles International Airport, Los Angeles 45, California



SERVICE FACILITIES. AiResearch offers the most complete facilities in the country in all phases of aircraft service. This includes rapid and efficient turn-around service.

REBUILDING AND MODIFICATION. Complete engineering modernization service, outstanding interior styling and fine craftsmanship combine to give your airplane high performance and luxurious comfort. Some satisfied customers are National Cash Register, Thompson Products, Humble Oil, Chicago Tribune and Goodyear.

Magnetic Memory System Solve Air Traffic Problems

A "magnetic memory system" has been developed to help solve a growing communications problem plaguing the nation's air traffic control centers. With a domestic scheduled airliner taking off or landing at least every seven seconds, the problem of supplying weather and other air traffic control data to a growing air-transportation industry is gargantuan. It was to solve this communications problem that the uncanny "magnetic memory system" was developed.

Known officially as the Message Storage and Processing Equipment (MS&P), the new system was developed and manufactured for the Air Navigation Development Board by Engineering Associates Division of Remington Rand, Inc. It not only will "memorize" up to 2,000 separate messages at one time, it also will answer questions concerning these messages in one-half second, teletyping its replies to all parts of the country in a minute or less. It also will perform highly complex clerical operations such as filing and detecting conflicts in proposed flight plans.

The MS&P Equipment has been accepted by the Civil Aeronautics Administration and currently is being evaluated for use in both air traffic control and weather information systems at the Technical Development and Evaluation Center at Indianapolis, Indiana. Before being accepted by the CAA, the equipment was subjected to a long series of rigorous tests at the Remington Rand Engineering Research Associates laboratories. These tests required several weeks to complete and were designed to simulate actual operating conditions. Specially prepared message tapes were continuously run through the equipment, often for 16 hours a day, and the equivalent of 10,000 such messages were successfully processed.

Heart of the MS&P Equipment is a magnetic storage drum, measuring 30 inches in length, 22 inches in diameter and containing 406 magnetic heads. This drum is a revolving cylinder which is rotated at a speed of 1,190 rpm by a 1½-hp 3/60/220-440 volt Fairbanks-Morse axial air-gap motor. The drum can process up to 2,000 messages at the rate of 23,000 characters per second, and at full capacity requires 50 teletype lines to handle its outgoing messages. The axial air-gap motor, first revolutionary change in motor design in decades, was chosen because it met the rigid requirements for a true running, vibration-free unit, capable of both intermittent and 24-hour-per-day service.

The MS&P Equipment will receive and process a wide variety of coded messages, such as information concerning proposed departure times, "fixes" over certain points enroute, fuel loads, destinations, payloads, estimated times of arrival, and other flight-plan details. It also will store information concerning the latest weather conditions reported.

Flight data information is fed into the magnetic storage drum by teletypewriter; it is "read through" by the equipment to see that it adheres to a fixed format and is complete in every detail; it is checked with other flight data information held in storage to see if there is potential conflict in time, route or altitude between two or more aircraft; and finally the information is stored in the drum in the form of magnetic marks made on the revolving cylinder. If everything is in order, the equipment completes its function by returning a copy of the recorded flight data to the ATC Center operator. If everything is not in order, the equipment will so notify the operator and will cite the discrepancy.

An automatic clock read-back provision of the MS&P Equipment causes it to scan its entire "memory content" every 10 minutes. All pertinent flight data information discovered which contains times falling within the ensuing 20-minute period is automatically transmitted to the ATC Center concerned. On command, the equipment also will print out all 2,000 of its currently held messages.

It has been estimated that from 12 to 15 such MS&P systems would be sufficient to service all of the major air traffic centers in the nation.

Among the benefits the MS&P Equipment offers the nation's air traffic control centers, all of which currently are being evaluated by the Technical Development and Evaluation Center, are the following:

1. It will minimize the amount of flight plan and weather information now cluttering a traffic controller's progress board, holding this information in storage for split-second reference and helping to increase over-all efficiency.
2. In emergencies it will provide a ready source of complete information concerning a particular flight, thus speeding up possible emergency rescue work.
3. It will help prevent accidents by detecting time, altitude and route conflicts between two or more proposed flight plans.
4. It automatically will warn busy airports that the maximum flow of incoming traffic at their fields will be exceeded within a short time unless measures are taken to correct the situation.
5. It will provide Air Defense with a split-second source of reference for checking unidentified aircraft, and also will advise a private company exactly where its company plane is at any time.
6. It will warn airport officials when a flight has not reported on schedule and is overdue over a particular "fix."
7. It will facilitate the work of computers and calculators needed to determine the exact effect of wind and other weather conditions on estimated "fix" and arrival times.

It is predicted that the MS&P equipment will be adopted for use in airline passenger-reservation systems and in other filing and reference systems which require high-speed handling of important data.

New Lightweight VHF Antenna Announced

A new Type 200 rustproof VHF antenna, which is inexpensive and lightweight, has been designed and manufactured by Electronics Equipment Engineering, Inc., of Dallas.

The new 1½ pound antenna is made of stainless steel and is both rust and corrosion proof. The base insulator is of linen bakelite, vacuum impregnated to assure long life and top performance.

For moderate-speed airplanes, the EEE antenna has a heavy aluminum cover and a connector box which eliminates the possibility of electrical shorting. It also permits installation in luggage compartments or other exposed areas without the addition of expensive protective covers.

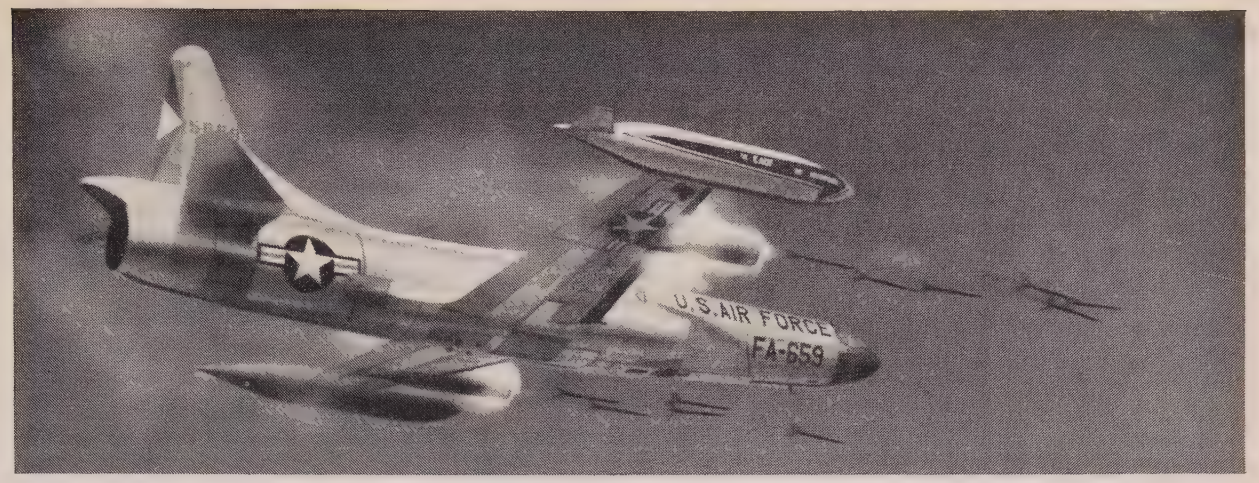
The EEE antenna is designed for operations in the 116 to 136-mc range and the electrical connection is pro-

New U.S. Concept for

TOTAL DEFENSE

In this age of awesome airborne nuclear weapons, a vast umbrella of airborne electronics will safeguard our nation against sneak attack

BELOW—A WEAPONS SYSTEM IN ACTION. An electronics-laden Super Constellation early-warning plane (**A**), patrolling our outermost defense perimeter hundreds of miles from our shores and borders, from its high altitude can "see" beyond the horizon and detect both high-flying and low-flying enemy aircraft (**B**). Using its powerful search radar (**C**) and height-finder radar beam (**D**) to pinpoint position of invaders, the patrol plane alerts our interceptors (**E**), which swarm aloft and are radar-guided through fog or darkness to intercept and

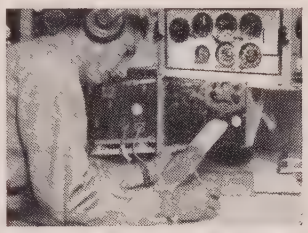


LEFT—EARLY-WARNING RADAR PATROL. Designated the WV-2 by U.S. Navy and EC-121 by USAF, these radar-domed Lockheed Super Constellations carry six tons of electronics and a 31-man crew. Super Constellations are ideal for this duty because of their famed all-weather stability and extremely long range.

ABOVE—ROCKET-FIRING STARFIRE INTERCEPTOR. First of the almost-automatic all-weather interceptors, the Lockheed F-94C Starfire is an example of Lockheed's leadership in the design and development of airborne electronics. This deadly defender and other interceptors will soon be supplemented by—

Farsighted Pentagon planning and recent amazing technological developments by U.S. science and industry are rapidly making our nation's TOTAL DEFENSE system the most formidable in all history.

Lockheed's role in implementing our new Weapons System concept and in Systems management, is an important one. Thousands of Lockheed military aircraft, of *nine* widely different types, are already in service. Other advanced planes, missiles and electronic guidance devices are in production, undergoing tests or on the drawing boards at Lockheed. And Lockheed's pioneering leadership in design and development of airborne electronics will continue to contribute heavily to TOTAL DEFENSE.



STILL-SECRET F-104 SUPERSONIC JET FIGHTER. (Photo not yet released.) A high-ranking USAF officer said of the F-104: "This is a fighter pilot's dream. We feel confident that it is the fastest, highest-flying fighter in the air, anywhere."

THREE PHOTOS AT LEFT show crew members of Super Constellation early-warning plane at work. (Top) Navigator plotting a fix; (center) observers at radar consoles plotting altitude, speed and course of unidentified aircraft; (bottom) fighter-director charting position and path of approaching aircraft.

Lockheed

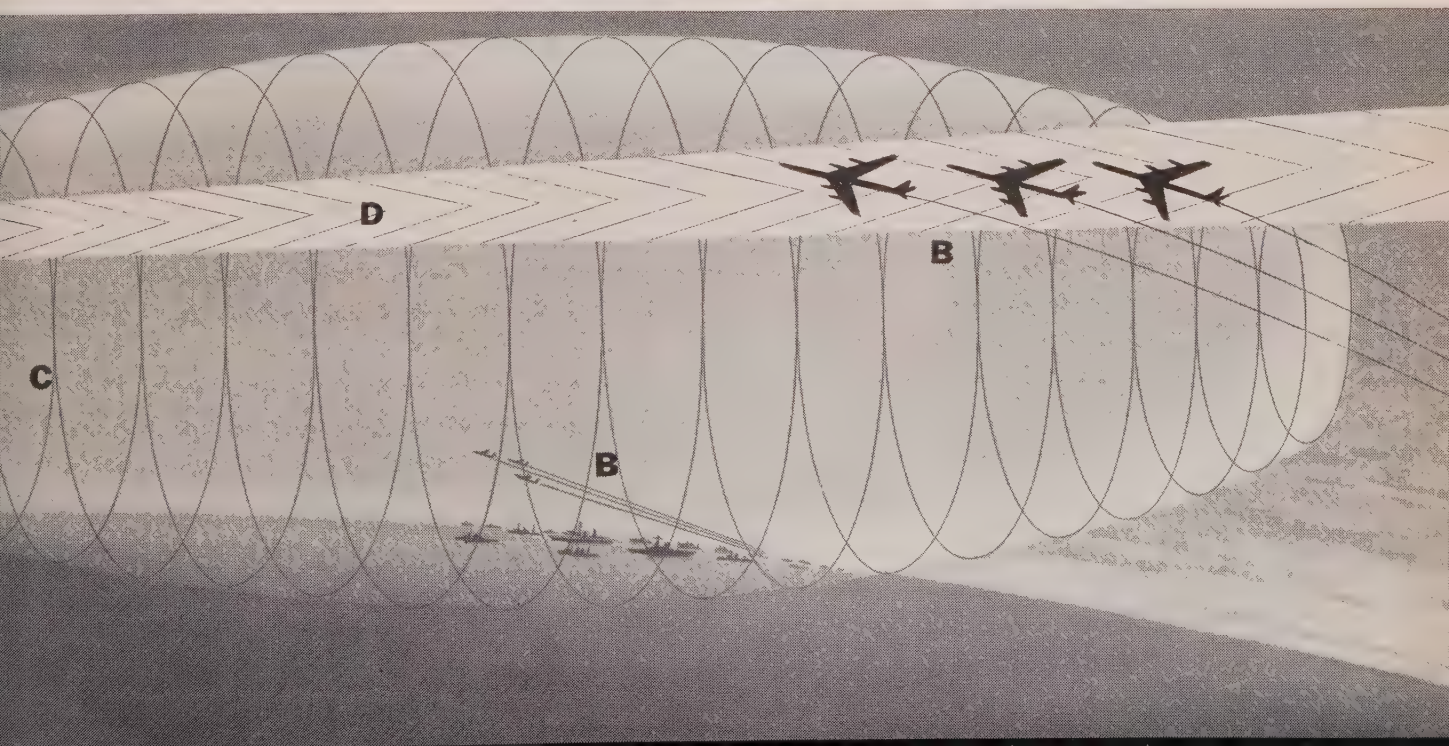
AIRCRAFT CORPORATION

California Division, Burbank, Calif.
Georgia Division, Marietta, Ga.
Missile Systems Division, Van Nuys, Calif.
Lockheed Air Terminal, Burbank, Calif.
Lockheed Aircraft Service, Burbank, Calif.

LOOK TO LOCKHEED FOR LEADERSHIP

A CAREER IN MILITARY AVIATION ASSURES A FINE FUTURE FOR YOUNG MEN OVER 17. SEE YOUR NAVY OR AIR FORCE RECRUITING OFFICER.

stroy the attackers with high-speed rockets or missiles. Any enemy rcraft penetrating our barrier patrol areas would be detected by shore-sed radar stations (F) and Ground Observer Corps outposts contin-ously manned by patriotic civilians helping to keep our nation free.



VHF ANTENNA, *designed to operate 116 to 136 mc, weighs just 1½ lbs; is rustproof*

vided with the 38-IR connector permitting use of any standard 52 OHM coaxial cable.

Air Defense Identification Zones and Defense Areas

Effective December 1, 1955 the ADIZ areas were radically revised. Your attention is directed to the new chart, copies of which are published with details of the regulations in *Airman's Guide,* Radio Facility charts, *Jeppesen Airway Manuals* and other special reports, as well as on *page 15* of this issue. In general, the changes consist of creating ADIZ corridors or buffer zones around the newly designated Eastern and Western Defense Areas. The purpose is primarily to control flight towards or into these highly important target areas. For example, you may fly VFR freely within or out of these Defense Areas, except through a Coastal ADIZ or subsequently into another ADIZ beyond the immediately bordering ADIZ. IFR flight anywhere is, of course, expected.

Similarly, you may fly freely within the designated Central and Florida Open Areas. Also you may fly outbound from the Central Open Area into or through the Northern or Southern Border ADIZ, but not into the Eastern, Western or Albuquerque ADIZ. However, you may fly out of the Albuquerque ADIZ, providing your track takes you no closer to Albuquerque or Los Alamos, N.M. than your point of take-off, and you do not subsequently enter either the Eastern or Western ADIZ without filing a DVFR.

The above is not true of flight originating within any other ADIZ, wherein you must file a DVFR regardless of direction of flight. An over-all exception to these rules is the new altitude limitation of 1500 feet or less above terrain (rather than the old 4,000 feet) and the additional requirement that airspeed must not exceed 125 mph even at or below 1500 feet! Another over-all exception permits local flight within 10 miles of take-off. Another is the fact that you may make a DVFR flight without two-way radio providing you adhere closely to your pre-takeoff filed DVFR flight plan. That is, actual take-off must be within five minutes of filed time, time of penetration or time over planned reporting point must be within five minutes and track must not exceed 10 miles from center line of your filed route.

Similarly, the filed altitude must be adhered to except for a reasonably close-in letdown. Obviously, two-way radio enabling proper pre-notification of any changes after take-off relieves the above stringent requirements. And if somebody on the ground can be trusted to communicate a revised off time, altitude or route change it would be within the regulations.

The regulations do not prohibit filing by radio in the air, although if you got above 1500 feet or exceeded 125 mph, and turned back because of radio contact difficulty toward a station

Air-Aids Spotlight

ABILENE, Tex.—*LFRange procedure turn now east of north course.*

BILLINGS, Mont.—*ILS Localizer, Middle and Outer Comlo's decommissioned and approach procedure cancelled.*

BUTTE, Mont.—*(Whitehall Approach)—VOR approach track swung southward from 274° to 268° to add better clearance from high terrain 2 mi east of airport. Final approach path passes south of airport.*

CHICAGO, Ill.—*O'HARE ILS Middle Comlo frequency now 230 kc.*

DENVER, Col.—*AURORA FMarker on south course LFRange now ENGLEWOOD FM.*

EL PASO, Tex.—*New VOR/DME procedure permits elimination procedure turn.*

EVANSVILLE, Ind.—*Outer Marker Glide Slope altitude now 1704 ft.*

GREENSBORO, N. C.—*New VOR/DME procedure permits elimination procedure turn.*

IDAHO FALLS, Idaho—*LFRange frequency changed to 350 kc.*

NASHVILLE, Tenn.—*Account new 2050-ft TV tower 11 miles on south edge SW course LFR, ILS transition from Fairview, LFR initial approach on SW course and missed-approach altitudes all raised to 3,000 ft.*

NEWARK, N. J.—*ILS straight-in approach mininums 200 - ½ now include Runway 4 visibility 2600 ft.*

PHILADELPHIA, Pa. — *ILS Back Course approach now approved landing Runway 27.*

RALEIGH, N. C. — *Final approach altitude over LFRange now 1200 ft.*

ROCHESTER, N. Y.—*LFRange shut down for modernization due resume operation shortly.*

SACRAMENTO, Cal. — *ILS Middle Compass Locator frequency now 260 kc.*

SAN DIEGO, Cal.—*VOR to resume operation on 114.5 mc on new site alongside SAN DIEGO LFRange.*

SEATTLE, Wash. — *VOR approach procedures cancelled at BOEING and SEATTLE-TACOMA.*

SQUANTUM, Mass.—*LFRange frequency now "SQT".*

STILLWATER, N. J. — *New VORW on 112.6 mc, ident "STW" northeast of ALLENTOWN and STROUDSBURG serving Victor 188 hi-altitude traffic crossing Victor 39 between Red 8 and Red 23.*

TOLEDO, Ohio — *TOLEDO-EXPRESS Airport Tower LF now 396 kc.*

TORONTO, Ont.—*VOR on 116.2 mcs, ident. "YZ," due commissioning shortly.*

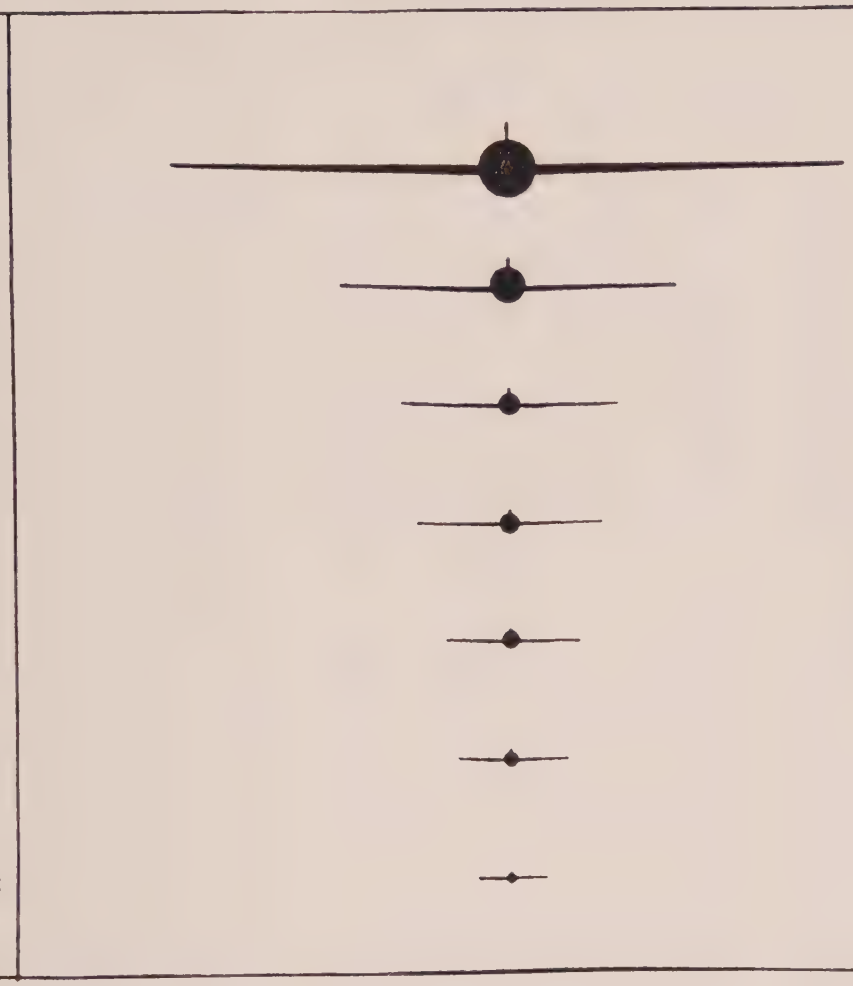
TRENTON, N. J.—*TVOR approach procedure published with mininums to 600 - 1.*

WASHINGTON, D.C.—*TVOR frequency changed to 110.6 mc.*

WESTMINSTER, Md. — *VOR being tested at this busy intersection of RED 29, RED 33 and Victor 31/33, Victor 166.*

WINSTON-SALEM, N. C.—*All IFR approach pull-out altitudes changed to 4,000 ft.*

COMPARATIVE DIAGRAM SHOWING THE VISIBLE OUTLINE OF AN AIRCRAFT WITH 106 FT. WING SPAN SHOWING ALSO THE RELATIVE SPEED OF APPROACH AT 360, 600 AND 960 M.P.H.



	m.p.h. 960	m.p.h. 600	m.p.h. 360
	Secs.	Secs.	Secs.
1 Mile	3·75	6	10
2 Miles	7·5	12	20
3 Miles	11·25	18	30
4 Miles	15	24	40
5 Miles	18·75	30	50
6 Miles	22·5	36	60
10 Miles	37·5	60	100

Note:- WHEN THE DIAGRAM IS OBSERVED FROM 16 Ft 8 Ins. (200 Ins.) THE IMAGE SEEN IS EQUIVALENT TO THAT OF AN AIRCRAFT OF 106 Ft. SPAN WHEN SEEN FROM THE DISTANCE INDICATED IN THE LEFT HAND MARGIN.

which lay in the inbound direction toward a Defense Area, you would be immediately in violation. You might also be subject to fighter interception to confirm identity on an "air filed" flight plan even if you otherwise adhered exactly to regulations.

To discourage air filing, pilots contemplating flight in which the filing of a DVFR plan is *required*, may call the *nearest* CAA Communications Station *collect* by advising the telephone operator "SECURITY PILOT (your last name)."

It is suggested that you study the entire and detailed Security Rules as published and note the geographical boundary information on your charts as it will take some time for them to appear on all Sectionals.

Specks on the Windshield . . . or Someone Else!

Through the courtesy of Flight Safety Foundation's director, Jerry Lederer, we are privileged to present a graphic and somewhat startling illustration of just what may be the last physical observation made on this earth by some pilot at some not-too-distant date. In the hope that that unpleasant eventuality may somehow be avoided, we refer you to the self-explanatory chart (above). Remember, as you test the image scale, that any unfamiliar speck on your plane's windshield (no bigger than those seen here), that does not change its location in a reasonable time (*i.e.* constant bearing angle) is probably not just a piece of dust or a fly made lethargic by anoxia. It would be an oncoming plane at your altitude and you might have 10 seconds to do something about it!

Official NBAA Report

NATIONAL BUSINESS AIRCRAFT ASSOCIATION, INC.

(formerly Corporation Aircraft Owners Association)

National Business Aircraft Association, Inc. is a non-profit organization designed to promote the aviation interests of the member firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable business aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. NBAA National Headquarters are located at 1701 K Street, N. W. Suite 204, Washington 6, D.C. Phone: National 8-0804.

NBAA Board Approves Miami For 1956 Annual Convention

At the recent Board of Directors meeting in Columbus, Ohio, Miami, Florida, was unanimously selected for NBAA's Ninth Annual Meeting and Forum. Plans are underway to hold the convention the latter week of October or the first week in November. As soon as hotel arrangements are made, it will be announced in the report.

As an indication of the enthusiasm and interest of NBAA members in the Miami area, a 1956 Miami Convention Arrangements Committee already is formed and operating under the Chairmanship of William "Bill" Lawton, Director, Public Relations and Advertising, L. B. Smith Aircraft Corporation. Other committee members are: Mrs. Isabel McKay, President, Embry-Riddle School of Aviation; Herman Waker, Manager, Customer Service Aircraft, Aerodex, Inc.; Earl F. Johnson, Chief Pilot, Storer Broadcasting Co.; Ken Benson, President, Greater Miami Aviation Association; Kitty Markham, Florida Civil Air Patrol.

Chairman Lawton has assured Miami will go "all out" to top all previous National Business Aircraft Association conventions.

Business, Industrial Leaders Appointed to Advisory Council

Leading American business and industrial executives have accepted appointments to the newly created executive advisory council of the National Business Aircraft Association, Henry W. Boggess, NBAA president, has announced.

The council, to be composed of 15 members, has been formed to help guide NBAA's board of directors on policy matters that may affect the future growth of business flying. The council will meet jointly with NBAA directors at executive sessions. First meeting was held December 9 in New York.

"The members who comprise this council are truly representative of America's most important executives," Boggess said. "With their help and guidance, business flying may well be entering a new and more progressive era."

Named to the advisory group were Theodore H. Belling, president, Fram Corporation; Herbert P. Buetow, president, Minnesota Mining & Manufacturing Company; General Lucius D. Clay, chairman of the board, Continental Can Company; J. C. Donnell, II, president, Ohio Oil Company; F. F. Elliott, president, The Crane Company.

Also William V. Fisher, president, Anchor Hocking Glass Corporation; Roy A. Fruehauf, president, Fruehauf Trailer Company; E. E. Lundberg, president, Briggs Manufacturing Company; R. S. Reynolds, Jr., president, Reynolds Metal Company; W. E. Robinson, president, The Coca-Cola Company; P. C. Spencer, president, Sinclair Oil Corporation, and Kenneth C. Towe, president, American Cyanamid Company.

NBAA Director Strikes Blow At Attitude of Field Managers

NBAA's Executive Director, Jean H. DuBuque, recently told Southeastern Airport Managers' Delegates, during their three-day convention in Greenville, South Carolina, that "top notch service to the fleet of 21,500 business aircraft criss-crossing the nation day after day, now 16 times larger in number than the domestic airlines, will pyramid revenue to airports in the Southeastern section of the country, *if* the managers work to deserve it."

As principal speaker at the Friday luncheon, the NBAA official struck sharp verbal blows at the laxity and indifference of some airport managers toward one of their greatest potential sources of income —the Business Aircraft Operator.

"Our heaviest member-complaint is from owners being required upon landing to taxi to the other side of the airport to discharge passengers," DuBuque continued.

"May we be pardoned for thinking that something smells awfully sour at the airport if important passengers have to be walked around the airport boundary to the loading gates (if no courtesy car is available) and luggage has to be toted over to them promptly if they are making an airline connection, or they are compelled to wait needlessly for transportation to town, just because an empty loading gate is 'off limits' to the business planes."

"NBAA members operate planes to save time for busy executives." DuBuque implied that many airport managers weren't helping to save that time. "From the moment a business pilot contacts the tower until he leaves the airport, he's a customer, with potential profit in his business. NBAA feels that business-aircraft operators should be treated on an equal basis with airline operators.

"Good restaurants serving appetizing food, adequate and clean washrooms, transportation available to downtown, are important to executive passengers," DuBuque said. He added that too few airports make any effort to see that such services are available at all times, making it clear that some airports do and those are the profitable airports.

"Don't forget that business-aircraft pilots are just as anxious for you to make money as you are," he continued, "but they do demand super-service because their bosses demand it of them."

DuBuque concluded that "quick, efficient and reasonably priced service, rather than mediocre services and minor interest in being accommodating, will insure your airport of future NBAA business."

NBAA is strongly urging airport managers around the country to study the needs of business-aircraft operators and to gear their facilities and services to meet the ever-increasing demands in this rapidly growing segment of civilization.

CAB Plans "Near-Collision" Pilot-Reporting Program

Have you just "missed" being involved in an air collision? Has another aircraft suddenly loomed up in front of you too close for comfort?!! Have you taken evasive action to maintain safe separation distance? Have these or other experiences of another aircraft coming "too close for comfort" happened to you?

The danger of aircraft colliding in mid-air is becoming increasingly serious as air traffic and aircraft speeds increase. All segments of aviation, whether military or civil, are vitally concerned with this.

In seeking a solution to this, as to any problem, the first step is to learn as much as possible about the conditions and circumstances which enter into the cause. The Civil Aeronautics Board, after conferring with the Civil Aeronautics Administration, NBAA and various other aviation organizations and associations, both civil and military, is planning to undertake such a program. The immediate objective of the program is to find out from every pilot who has a "near-collision," all of the circumstances that existed in connection with the incident.

In the past, certain segments of aviation have conducted a similar poll. It is now apparent, however, that a single cross-sectional poll of all of aviation is needed so that as complete a picture as possible can be obtained of the conditions which allow collisions to occur. From these results, it is expected that remedial action can be taken to eliminate or reduce the hazards of collision insofar as it is possible to do so.

Since this is a grass-roots type of program, *reports from pilots are essential to*

the success of this program. The real, honest-to-goodness facts, as reported by each pilot who experiences a "near-collision," will provide the basis for the study. Accordingly, every NBAA member pilot has a personal responsibility to assist the CAB in bringing to light the facts existing in each "air-miss" experience.

All reports will be anonymous—no signature or identification of aircraft is required and these reports will be handled as confidential material and will be *destroyed* after the basic information has been taken from them. No date, time, or specific location will be included in the form. There will be no attempt made to check on any report for the purpose of taking action against any pilot or operator.

The proposed questionnaire is a "check" type form; the items of interest can be checked off, thus providing a quick and easy method for you to report the circumstances of the incident.

It is a self-addressed form—no stamp required—and can be completed and mailed with a minimum of expended time or effort.

The "Near-Collision" questionnaire forms will be distributed in the near future and will be available throughout the industry; various organizations such as NBAA, ATA, ALPA, AOPA, and the Military Services are assisting in this distribution.

All Airport Managers, Operations Officers, Dispatchers and others in a position to do so, are requested to arrange to obtain supplies of the "Near-Collision" questionnaires and make them available when notification is given by the CAB. If these forms cannot be obtained through the normal channels of your own company, write to the Civil Aeronautics Board, Washington 25, D.C., Attention: Bureau of Safety Investigation.

Meigs Field Lengthens Runway to 4,000 Feet

Meigs Field, Chicago's lakefront business flying airport, is having its 2800-ft runway extended to 4,000 ft. This is one of the world's busiest and most convenient executive airports. Meigs has been averaging betwen 8,000 and 9,000 planes a month, 60% of them being multi-engine business planes. Practically 90% of all this traffic is on weekdays. With its new 4,000-ft runway length, business-plane traffic is expected to skyrocket.

NBAA Urges Increase in Federal Aid to Airports

Your community may be eligible for Federal aid on an airport to serve *general aviation.* Since an increase in percentage of Federal aid projects is being urged by NBAA, as a member of the CAA Airport Review Advisory Committee, to benefit smaller cities and towns serving business flying, the following is for your information:

To qualify for an airport and to serve general aviation (business, agricultural, commercial, industrial, charter, small irregular carrier, instructional, personal flying, etc.), a community must evidence some of the following conditions: 1) Operate an airport which is attended daily during normal working hours by an aircraft service organization based at the airport and offering, as a minimum service, the sale of aircraft fuel and oil. 2) Have 10 or more airworthy aircraft based in the community or the nearby area, provided its airport or landing strip would serve the primary needs of the aircraft as a base for repairs and service. 3) Furnish evidence that inadequate airport facilities is the main factor in retarding its airworthy aircraft population and that a larger number of aircraft would be based in the community, or a greater degree of use by aircraft based elsewhere would be made if adequate airport facilities were available. 4) Accommodates extensive air traffic during a protracted seasonal period. 5) Has needs not measurable by the number of based aircraft, where the airplane performs a useful task and the degree of use by business, agricultural, commercial, industrial, charter, instructional, personal flying, small irregular carriers, etc., existing or forecast, is economically important to the community. 6) Community is located where an airport, at least during certain periods, can be justified on the basis that it is required to permit the delivery of food and supplies or serve in lieu of other transportation media. 7) Serves a national park, national monument, state park, or other major recreational area, and has a sufficient volume of traffic, existing or forecast, to justify an airport or landing strip. 8) Airport is needed in the community for the preservation of national resources or to serve the civil needs of Federal reservations or installations, and this need is certified by the appropriate Federal agency. 9) An emergency field to serve general aviation is needed in the community because of weather or terrain conditions along established routes. 10) An airport is needed in the community for some special reason not listed above, provided evidence can be furnished to show that the satisfaction of the need is essential to the public welfare. Business aircraft operators are requested to cooperate with the community leaders in the airport development programs.

Idlewild to Activate 123.9 Mc to Replace 124.9

The CAA has advised National Headquarters that on or about January 1, 1956, a new radio frequency will be introduced at the New York International Airport control tower (Idlewild). It is proposed to activate the frequency 123.9 mc as a replacement for 124.9 mc in the approach control service at Idlewild due to serious interference that now occurs on the latter frequency.

The frequency, 123.9 mc, at the present time is not generally available in airborne equipments but because of congestion and a critical shortage of usable frequencies in the New York area, the CAA states they have no other choice than to establish service on 123.9 mc.

All operators who intend to conduct instrument flight rule operations into New York International Airport after the first of the year, are strongly urged to obtain necessary crystals and make other preparations to utilize the frequency 123.9 mc for approach control service at this airport. Having the proper frequencies in the aircraft will very often avoid delay in handling times.

Watch That Seat Belt

Accident experience has shown that the long loose ends of aircraft seat belts can be thrown forward, causing some types of belt clasps to loosen, thus forcing a person to slide forward if not entirely released from the belt. Seat belts that have these long extensions should be either tucked under the belt after it is tightened or retained in a loop similar to those on trousers to prevent the over-center clamp from releasing the belt.

New CAA Regulation On Sale of Aircraft

Business aircraft owners who sell their aircraft must notify the Civil Aeronautics Administration immediately, under newly-effective Regulations of the Administrator.

Notification formerly was required only when there was a change of address. The new requirement was brought about by frequent difficulties in establishing legal title to aircraft.

"Under the old system, an aircraft might change hands several times without anyone advising the CAA," according to C. D. Heath, Chief of the CAA Administrative and Records Branch. "Then the final owner would come in and want to register the plane.

"Obviously, we couldn't register it until the owner had established the complete chain of title for our records. As anyone can imagine, this led to all sorts of correspondence and irritation on the part of the owner who bought in good faith."

Under the provisions of the new regulation, the burden is on the seller to notify CAA immediately of the sale or export of a plane. The new owner, before he can fly the plane, must mail to CAA a completed application for registration form, a bill of sale or other evidence of ownership, and $4.00 registration fee. As soon as this is done, the purchaser may fly the aircraft for 60 days since the aircraft legally is "deemed registered" when the owner has submitted the proper documents to CAA. By the end of the 60-day period, the permanent registration certificate will have been received. Send notification of sale or export to Civil Aeronautics Administration, Administrative and Records Branch, W-240, Washington 25, D.C.

NBAA's New Directory Now Available to Users

NBAA's "Directory of Business Aircraft" has been completely revised, including a new format for quicker reference. It is divided into two sections, one a numerical listing of all aircraft owned and operated by the membership, and the other an alphabetical listing, including the names of key officials and Chief Pilots. A permanent type, loose-leaf binder contains the listings. Non-member companies and corporations of NBAA may procure copies of directory for a nominal cost, providing request is received on official letterheads.

FUELS-OILS

Features and Facts Pertinent to Successful Flight Operations

Two New Swivel Joint Types For Fuel and Other Lines

Two new swivel joints, one for lines that need a free swiveling action, the other for lines that must lock, have been announced by the Chiksan Co., of Brea, Calif. Both are described as "extremely" low in cost.

The line joints come in half and three-quarter-inch sizes.

First of the joints is a permanent clamp design for use on air, fuel, hydraulic and other lines where a free-swiveling action is necessary. The second joint is a controlled torque design for use on coolant and other flexible lines which must be locked into position.

The freely swiveling, permanent clamp type is designated Chiksan Junior Joint No. 1 and its principal attribute is that it prevents hose kinking and, as a result, lengthens hose life and guards against hose attrition caused by constant kink-flexing. Torque, lock-in-position joint is designated Chiksan Junior Joint No. 2 and, according to its maker, may be very quickly positioned for rapid locking of lines.

Both joints are cast from the same material: Zemak #5, an alloy said to have good resistance to corrosion as well as the strength to retain dimensions under the impacts of usage. The clamps on both the joints are made of cadmium-plated steel for rust resistance.

Both the joints, too, are provided with "O" rings of a synthetic type which will handle aromatic fluids, gasoline, kerosene, lubricating oils, soluble oils, cutting oils, diesel oils, water and air. Special "O" rings that will handle synthetic hydraulic fluids also are available for these two new Chiksan joints.

Vythene Solvent Stabilized For Use With Aluminum

Since Trichlorethane was introduced as a cold cleaning and degreasing solvent, one particular problem has concerned users in the aircraft fields: it reacts violently with aluminum.

The chemical, it has been known, simply would not stand up under refluxing with aluminum. Within 72 hours, as a matter of fact, samples of Trichlorethane have reacted with aluminum, releasing a phosgene-type gas and hydrochloric acid in quantities sufficient to completely burn up the aluminum and turn the solvent itself into a tar-like mass.

Yet, opposed to that problem, there has been the fact that the chemical, which is just 1/20th as toxic as carbon tetrachloride, is a general-purpose solvent of considerable merit. In the degreasing of aircraft parts it has shown tremendous promise—again with the violent aluminum reaction as a qualifying factor.

Now that qualifying factor has been removed. According to an announcement from Tect, Inc., of Dumont, N.J., manufacturer of Vythene, "brand of Trichlorethane, this compound now has been completely stabilized for use on aluminum. Here is the company's official statement on the product as now being released:

"The latest Vythene available will withstand refluxing with aluminum in all stages of distillation—boiling, vapor, and condensate—without any breakdown of the solvent or corrosion of the aluminum even after refluxing has been continued for periods in excess of 2,000 hours."

In announcing the stabilization of Vythene for use on *all* metals, Tect, Inc. also announced a reduction in price in many delivery areas. The new price scale will be $1.73 a gallon in 55-gallon drums, a saving of six cents a gallon.

The newly stabilized Vythene product has a lower boiling point that some of the non-stabilized forms of Trichlorethane —it boils at 165° F. This may make it less effective for straight vapor degreasing but, in operations where there is provision for immersion in the distillate or sloshing of distillate over the work, Vythene is expected to show great utility.

Its non-toxic nature also continues to make it useful where workers may be exposed to concentrations of the solvent vapor.

Besides being used for the degreasing of aircraft parts, it has been widely used as a cleaner for electronic gear.

Thermal Barrier Sets Limits On Fuels for Supersonic Craft

Every phase of flight development, it seems, has been in large part the story of overcoming a known and palpable barrier.

Gravity, of course, was the first. But then, first on the edges of the prop itself, and later along the wings and control surfaces of jets, came such barriers as the so-called "sound wall." Too, there has been a thermal barrier for aircraft skins, subjected to the tremendous heating of high-speed friction and compressibility as the plane zooms along at sonic and supersonic speeds.

At exactly that point, oddly enough, it seems that fuels are running into what may be their first big "barrier" to overcome since the days that tetraethyl lead, the first additive, overcame many of the problems of the high compression reciprocating engine.

One of the first and most understandable outlines of this new fuel barrier has just been published in the Esso Export Corp.'s notable *Esso Air World* magazine. The outline of the thermal barrier as it relates to fuels is by A. B. Crampton, E. R. Wieland, and W. W. Gleason of the Esso Laboratories.

First of all, the authors raise a point that could easily escape the operator of conventional aircraft: that "in many types of jet aircraft, fuel is being looked to as a heat sink for cooling the lubricating oil and other aircraft components, such as radar, hydraulic systems, and air conditioning equipment."

The thermal barrier starts to raise, though, when it is realized that excessive heat can cause decomposition of fuel.

Already, in practice, the Esso research shows, "temperatures have actually been high enough to cause degradation of the fuel."

This condition, which is called "jet fuel thermal instability" is "manifested by the formation of insoluble sediment which clogs fuel systems and causes critical reductions in fuel flow."

Actually, this is one aviation "barrier" problem that is beyond the province of the men in the cockpit or even those at the drawing boards of the plane-building companies. This particular barrier will have to be demolished in the petroleum industry's refineries.

Already, the Esso scientists say in their report, "the need for fuels which are stable at elevated temperatures is becoming increasingly important to the continued development of new high-performance aircraft."

The stability of the fuel, thus, takes its place alongside the heat and speed resistance of engine metals themselves (as in the case, say, of turbine blades) as a strict limiting factor in aircraft development.

In finding the answers to the thermal stability problem, technicians have had to first devise a fool-proof method for predicting the thermal stability of any given fuel. In essence, the test systems devised are simply "scaled-down turbo-engine fuel systems." One such device now widely used is known as the ERDCO Rig. It is so built that the insoluble sediment formed during heating, deposits on a filter.

Fuel stability, using this system, becomes a measurement of the time required to plug the filter or cause a marked reduction in fuel flow.

Besides petroleum researches along this line, Pratt & Whitney have made available a mass of data obtained from actual performance of experimental fuels in a mock-up fuel system. In the mock-up, fuel stability is measured by the operating time required to reach a 20% reduction in fuel flow or, in the case of high quality stock, the reduction in flow obtained after 15 hours of operation.

The manner in which various test fuels stacked up in the mock-up tests, and as reported in the Esso paper, are of interest.

Three of the fuels showed very satisfactory thermal stability qualities when subjected to temperatures, while in the fuel system, equivalent to those that would be associated with new, super speed aircraft.

All three of these fuels got up to 15 operational hours without clogging the test filter at all.

One was a mineral spirit stock, of the quality associated with insecticide "carriers," but heavily acid treated so that it was essentially paraffinic. The second, also highly paraffinic, was an untreated alkylate bottoms fraction. The third, surprisingly enough, was a West Texas kerosene, which, although high in sulphur and aromatics and having shown up poorly in the ERDCO Rig, came out in the top three—with no filter clogging after 15 hours—in the actual mock-up tests.

Two fuels of marginal stability were an untreated fuel derived from a naphthenic crude and the refined portion of the West Texas kerosene after solvent distilling and sulphur dioxide extraction. These two fuels reduced the flow through the mock-up system by 7 and 9% respectively after 15 hours.

Four other fuels proved downright unsatisfactory in the tests:

1. A highly aromatic, low sulphur kerosene;
2. The same fuel after sulphur dioxide extraction;
3. A low solvency mineral spirit after light acid treatment;
4. A sample of production JP-4 used as a referee.

In order, here are the number of hours it took these fuels to clog the filter a full 20%:

1. Nine hours
2. Six and three-quarter hours
3. Three hours
4. One hour

The significant observations that the Esso research team made after its initial tests are as follows:

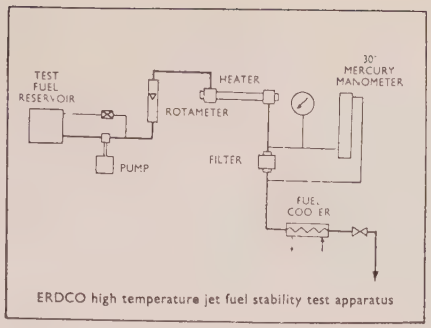
Stock segregation may be one means of improving high-temperature performance of turbo fuels. Fuels derived from different crude sources exhibited wide variations in high-temperature stability. Highly paraffinic stocks afforded the best performance.

Acid treating apparently can be used to improve the high-temperature stability. However, additional information is needed in this regard because different base stocks were used for light and heavy acid treated test fuels. A factor yet to be determined is the minimum amount of acid treating required to obtain high-temperature performance.

A comparison of the results of sulphur dioxide extracted and untreated fuels showed no apparent benefit in terms of thermal stability for sulphur dioxide extraction. However, this is being investigated further because laboratory tests in the ERDCO Rig have shown an improvement for the sulphur dioxide extracted fuels.

Hydro-treating jet fuel stocks may also be of benefit in obtaining improved thermal stability. This process may be of special interest because of the large amount of hydro-finishing capacity which is being installed by the oil industry.

Naturally, even the hints of direction for future success are beset by consequent problems. If, for instance, stock segregation seems a good idea in setting up fuel runs that will be highly paraffinic and thus more heat stable, it must be remembered that segregation will result in considerably increased handling and storage problems and thus in less availability.



ERDCO high temperature jet fuel stability test apparatus

That alone may shift the emphasis onto treating and processing techniques as a major solution.

Other solutions, of course, may be found in additives.

Work so far has emphasized conventional oxidation inhibitors. Here is how the Esso reports sum up the progress so far:

"Many (oxidation inhibitors) proved to be of little benefit in reducing high-temperature sediment formation. As a result, this opened up an essentially new field for additives, and work in this field has revealed some promising leads."

In an ERDCO Rig, for example, the very *unsatisfactory* JP-4, which brought on a 20% filter clog in only an hour of superspeed operation in the mock-up, was tested with two experimental stability additives. The results obtained from one additive showed that instead of taking 11 minutes to produce a critical fuel-flow drop in the ERDCO Rig, the JP-4 now took 80 minutes. In the mock-up tests, the one hour that the plain JP-4 took to clog the filter was stretched to 7¾ hours. The second experimental additive did even better, giving the fuel 100 hours of pre-critical life in the ERDCO Rig and 10 hours with *no clogging at all in the mock-up!*

The additive, thus, moved the poor fuel up into the intermediately satisfactory class. And that, the Esso report indicates, is just a start. But, the paper warns, "the incorporation of additives in jet fuels must, of course, be approached with caution. There is always the possibility that different fuels may respond in different ways to additive agents. An additive which exhibits potency in one type of fuel may have little or no effect in another base stock. Furthermore additives must not introduce new problems such as altitude foaming, emulsions, or interference with low temperature flow."

Just what is the nature of the deposits formed in this "thermal barrier" decomposition of jet fuels? One detailed answer, based on the deposit left by the JP-4 on nozzle screens of two jet engines is offered in the Esso report. The deposit was 31.6% carbon, 4% hydrogen, 4.6% nitrogen, 14.8% oxygen, 5.3% sulphur, and 34.4% ash.

Another important factor in this "thermal barrier" has been found to be the amount of air or oxygen available at high temperatures. In this, of course, the thermal barrier presents nothing more surprising than any other "hot" decomposition process.

Bomb tests run by the Esso team showed that at 300° Fahrenheit, sediment formed in an air-saturated fuel, run in an air atmosphere, was about three times greater than the sediment formed in an air-saturated fuel run under an inert nitrogen atmosphere.

"These results," the report states, "suggest removal of dissolved air and inert blanketing of aircraft fuel tanks as possible means of reducing the formation of high temperature sediment."

The report goes on to point out that "most of the full-scale experience with jet fuel (that is, as regards thermal stability) has been obtained in ground operation. It would appear that in flight service, the removal of dissolved air from the fuel during climb would tend to reduce the severity of altitude operation. This would allow a much longer and perhaps more satisfactory period of operation for certain fuels than the present tests have indicated."

Silicone Lubes Now Ready In Commercial Quantity

Just a year after announcing what it described as the first "true" silicone lubricant, the General Electric Co. is now marketing silicone lubes for jet aviation uses.

Available as both a fluid and a grease, the new lubricants are designated as Versilube F-50 and Versilube G-300.

At the time GE announced the market readiness of the new lubricants, William S. Kather, Sales Development Supervisor, specifically pointed out that "the fluid, Versilube F-50, is being evaluated both as a jet-engine lubricant and for new hydraulic systems."

Getting right down to the qualities of these new-type lubricants, one fact should be borne in mind. They have not been designed to replace petroleum lubricants in point of sheer lubricating quality. On the contrary, even GE only claims that the new Versilubes "will lubricate about as well as petroleum oils and greases."

Rather, the virtues of the silicone fluid and grease lie in another direction. The operating temperature range of the new lubes is from minus 100° F to over the 400° mark.

At the low end of the range, tests have shown, the fluid will still flow and bearings containing the grease will turn readily. Throughout that range, it is claimed, the fluid and the grease both show smaller changes in viscosity or consistency than standard lubricants.

Beyond that, General Electric is stressing some particular qualities of the fluid, the Versilube F-50. Described as a "tailor-made silicone polymer," it is said to possess some interesting qualities usually associated with additives but which in this case are present without the use of additives.

Its lubricity, the company says, is obtained without the use of "oily" additives sometimes associated with synthetic lubricants. It has a reasonably low pour point without the use of a depressant; temperature and viscosity properties are quite stable without using improvers; and the inherent high temperature stability is the result of the chemical composition itself and not of an oxidation inhibitor.

Technical information on both lubricants is being offered upon request through the Silicone Products Dept., General Electric Co., Waterford, New York.

Round Table

(*Continued from page* 15)

ble, is there a prescribed procedure pattern to be flown in connection with this identification?"

Gen. Shoop: "Yes, there is. Col. Jensen probably could tell you more about it than I."

Col. Jensen: "I'll have to put some of this in general terms because much of it is classified.

"We do have very definite instructions. For example, we try to approach in such a manner and from a position which will not startle the passengers in the other aircraft, and we do not go any closer than is absolutely necessary so we will not create a dangerous situation. The break-away is the same. We accomplish that so that we don't pull up in front of an aircraft and blast it with our jet wash. We should make it as smooth an operation as possible. There are very definite rules on proximity and the approach pattern. I regret to say there have been mistakes in the past in violation of those regulations on our part. However, we have a very emphatic check-out and training program all the time, and are continuously briefing our people.

"If you specify a minimum distance that a pilot can close to, I think that anyone that has done any flying will realize that it is all based on the judgment of the pilot. If a safe distance is set up and then the pilot flies so close a dangerous situation develops, I'd say the pilot's judgment was completely off. Of course, we know there may be a difference of opinion between two pilots as to whether they flew 400 yards or 500 yards from another aircraft, but it would have to be considered poor judgment if it were 50 yards as against 500 yards. The minimums are set up so that even with a slight mistake on the pilot's part, there still well be an adequate and safe distance."

Jack Womack: "Is there a program in the Air Force for continual practice-interception of civilian aircraft?"

Col. Jensen: "Speaking as a representative squadron commander of ADC, that is a part of the program. It is a requirement for a pilot and a radar observer as a team to maintain combat readiness and in so doing to accomplish a certain number of intercept passes, etc. However, this practice is not done against civilian aircraft."

Gen. Marriott: *"Are these practice intercepts made on aircraft that are actually questionable as to whether they are friend or foe?"*

Col. Jensen: "No, sir."

Jack Womack: "In other words, we may be intercepted anytime, whether we are on a flight plan or not?"

Col. Jensen: "Only if there is a reason for the intercept, and then you will never be intercepted by anyone but a perfectly qualified man. He has to go through this training program to become combat-ready and alert before he will be in a position to be scrambled against an unknown. It will be a man who has been well trained."

Jack Tighe: "Col. Jensen, do you practice interceptions against civilian aircraft?"

Col. Jensen: "No, this is a training we accomplish with our own aircraft."

Jack Womack: I've wondered about that because sometimes we have been intercepted by pilots who obviously flew a very poor interception pattern."

Jack Tighe: "Those are the things ADC works on all the time to cut out."

Gen. Marriott: *"Is the intercept pattern published somewhere?"*

Jack Womack: "I've read it on the back of *Airman's Guide.*"

Gen. Marriott: *"It's also in the Flight Information Manual. It is available to the civilian pilot so that he can recognize the maneuver when a fighter pilot approaches."*

Jay Dettman: "I'm not taking sides on this issue, but our carriers have experienced uncalled for intercepts. We had one recently. The jet pilot flew a very unorthodox intercept pattern which was really a buzz job. The Senior Controller at the Center in whose area this interceptor was operating at the time, made a real effort to identify the airplane, and he was convinced afterward that it was not an ADC airplane. The best guess he could make was that the airplane was from another command headquarters in the same general vicinity, but it was not an ADC operation.

"We have run down several others with the same results—that it was not an aircraft from an ADC unit."

Col. DeBolt: "Every time we get a sonic boom up in the valley, I'm the guy who's responsible, and I haven't been up there in months. I guess by the same token every time an airplane gets intercepted, it's always an ADC airplane doing it."

Gen. Shoop: "There are a lot of jets flying around that are not ADC aircraft. In fact, the ADC jets are considerably outnumbered. Every now and then you are going to find some guy making a pass at an airplane. As long as there are airplanes to fly, it's bound to happen."

Gen. Marriott: *"We have two airline representatives here, one from TWA and another from Western Air Lines.*

"Mr. Holtan, would you comment on this matter of interception?"

L. C. Holtan *(Regional Chief Pilot, Western Air Lines):* "I've been intercepted twice within the last year. However, I would prefer to go along with the previous comments that some of the scary-type intercepts, if you want to call them that, were not ADC intercepts at all. Actually, we have verified that fact. In the two instances of real intercepts, both were very smooth operations. The only question that comes to mind from my experience is in the matter of proximity. When you speak of a proximity of 400 yards, you can reduce that by 75% and be more accurate."

Gen. Marriott: *"You mean the intercept boys do come closer than 400 yards?"*

L. C. Holtan: "Yes, and I think that would be the main objection."

Gen. Marriott: *"Actually, they are authorized to come close enough to read the numbers."*

Col. Jensen: "Just one comment, please. I used the figures 400 and 500 yards merely as examples, and they do not necessarily reflect actual criteria."

L. C. Holtan: "We realize the necessity of the operation. However, there is some question as to the necessity of coming as close as they do. Possibly there are reasons we know nothing about. I will say that in the past year or so I have not heard any particular complaints about irregular-type intercepts by regular ADC intercept teams.

"Our problem is to try to prevent the intercepts, and we find that usually they are the result of a misunderstanding somewhere along the line, in our communications or in a matter of detail more than an actual violation. We are trying to eliminate or reduce intercepts by more precise flight planning and by being sure the necessary information is passed on."

Gen. Marriott: *"What kind of misunderstandings are you talking about?"*

L. C. Holtan: "In one particular instance we had filed a flight plan from Salt Lake City to Los Angeles IFR. In the vicinity of Las Vegas, we decided to cancel IFR and it was supposed to be an automatic transfer to DVFR. We were subsequently intercepted because of the failure of one of our radio operators to pass the information along. Sometimes a small detail in transferring a flight plan might cause an intercept and usually it comes as quite a surprise to the pilots involved because they have no knowledge of being out of line.

"Another time it's apt to happen is when we advise ADC that we are going to deviate due to weather, particularly thunderstorms, but we don't know how much we're going to deviate so we just estimate. Then we run into the situation of having said we were going to be 15 miles off course and we end up 30 miles off. That's a problem we have not licked."

Col. DeBolt: "Normally, I ferry an airplane back East from the plant out here, and then return via commercial airline. In which case, there I sit in one of those big fat machines at 20,000 or 22,000 feet; then we get over the Continental Divide and into a lot of thunder bumpers. Now according to the flight plan, the boys are flying VFR, and they'll tell you they are. But I know they aren't flying on an airway. I can look down and see Pueblo and know we're 150 miles off direct-line course, and they are still VFR and making time! How is this sort of thing taken care of in connection with the ADC effort?"

Jay Dettman: "Are you on a direct off-airway route?"

Col. DeBolt: "Direct. If I file direct, I'd better go direct unless I want someone to intercept me."

L. C. Holtan: "Fortunately, most of that type of operation takes place outside the boundaries of the ADIZ areas. In other words, when we fly to Minneapolis, most of our ducking of thunderstorms takes place between Salt Lake City and Minneapolis, so we are concerned only with the CAR's."

Gen. Marriott: *"That's a good point. Mr. Flanagin, what has been your experience?"*

Lee Flanagin *(Ass't Dir.—Operations, Western Reg., TWA):* "Les Holtan summed up the problem pretty well. I have investigated most of the intercepts that we have had, and there have been very few where the pilot had deviated from his plan without notification. Most of the intercepts have occurred either because of slowness in getting the information to the Center, or mistakes were made by the Center in copying the position report, or failure of the pilot to advise of a change in route.

"There also have been cases of what are called 'correlation intercepts' where there are two targets on the scope and one is

(*Continued on page* 30)

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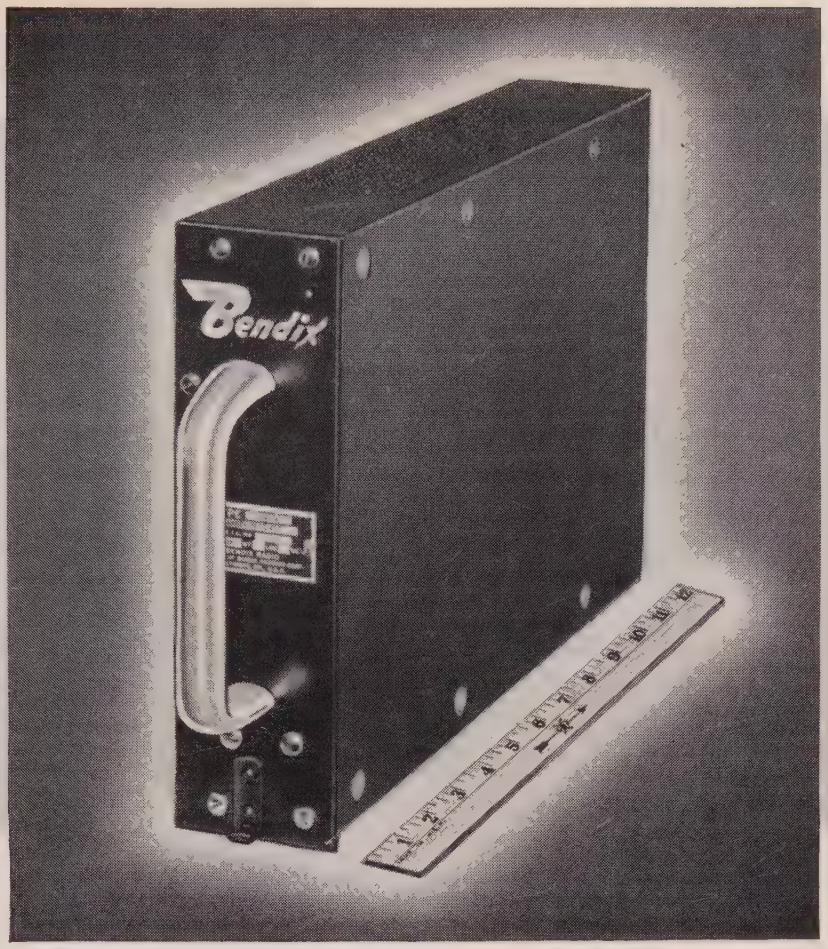

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Selectivity	Attenuation — Total Bandwidth 6 db — more than 40 kc 60 db — less than 250 kc
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Audio output impedance	500 ohms, nominal.
Power requirements	*AC Power Supply* 115 volts ac, 300-1000 cps, 35 VA with 27.5 volts dc for ON-OFF relay control. or *DC Power Supply* 27.5 volts dc, 36 watts.
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Round Table

(*Continued from page* 28)

unidentified so they have to take a look at both of them to find out who is who.

"Shortly after the identification zones were established, we were fortunate in having representatives from Norton AFB and the CAA attend pilot meetings in Los Angeles. Of course, it only took in the pilots based in the Los Angeles area. But since that time, only one Los Angeles-based pilot has been intercepted and that was because he failed to advise that he was going around a thunderstorm. Most of the intercepts have occurred to pilots coming in from Chicago or Kansas City. If the CAA and the Air Force could have similar meetings where other pilots are based, it would help to clear up the problems."

Gen. Marriott: "*Sounds like a very constructive suggestion. It might be particularly helpful if we go through minor revisions in the ADIZ set-up and any changes in rulings. What do you think, Col. DeBolt?*"

Col. DeBolt: "I think it's an excellent suggestion, particularly because of the differences in application to both civil and military aircraft."

Lee Flanagin: "There is one thing I question on these intercepts where there are two targets. If one aircraft is a DC-7 or a *Constellation*, for example, and the other aircraft is something else, is it necessary for the interceptors to actually come up and identify the known target? If they could take a look at the other airplane, they shouldn't have to come up and check the airline aircraft, too."

Major Sadek: "Lee, I think you have been the victim of a rather unusual occurrence in that, normally, we can tell which is which. However, I think you can see that if we don't know which is which, it would be pretty tough to take a look at just one of the aircraft and come up with an answer to the whole problem.

"When we start talking about whether or not the interceptor has to come in close to read and report the numbers, we again are referring to criteria. This is not a matter of the director's judgment, but is a matter of criteria that has been established as to whether or not an aircraft can be identified by type alone or do we have to find out through its markings, etc."

L. C. Holtan: "Are you satisfied with coming close enough to identify the airplane by number? It seems to me the aircraft are approaching much closer than is required to read the numbers off the tail, for instance."

Gen. Marriott: "*Speaking of numbers, I have heard comments to the effect that the numbers on civilian aircraft are so small in some instances that it's necessary to come in close to read them. That might not apply to airline aircraft, but it may to private and business aircraft.*

"*I understand a proposal has been made to make the numbers larger. I'd like to ask Col. Pardue, who is here from the USAF's Flight Safety Research, if he thinks that idea has any merit from a safety standpoint.*"

Col. L. J. Pardue (*Deputy Dir., Flight Safety Research, USAF*): "I would think so. I am not in the ADC, but I do know that the instructions to an intercept pilot are to identify the questionable aircraft and in some cases to get the number. He is not required to fly any closer than necessary. Therefore, if under daylight conditions, VFR, he can read the numbers, that is as close as he needs to be.

"I'd like to inject one other thing here. As far as I know, our records in Flight Safety show only one collision on identification between an interceptor and a civilian aircraft. On the other hand, on a straight VFR operation you know as well as I that we do have mid-air collisions from time to time. The very fact that an identification procedure is a regulated and well-planned operation should be of some encouragement because the record shows that we have virtually no collisions in this type of operation."

Jack Tighe: "I'd like to take the liberty of giving the background on ADC's interest in using larger numbers on aircraft.

"When I was first assigned to ADC headquarters by the CAA in 1952, the common complaint was that the interceptors were coming in too close. Some of these complaints were directed to the Commanding General, USAF, others to the Commanding General of ADC, and others to the CAA. Today, few of these complaints are received by ADC headquarters. In reply to these first complaints, however, ADC wrote to the CAB and CAA, reporting it had no desire to come in that close, but that the numbers on these airplanes were getting smaller and were being mixed in with fancy paint jobs. In short, it was becoming harder and harder to read them. ADC said that if they'd use larger numbers on the airplanes, their interceptors could stay further out. CAB came back and said. 'Why can't you read the big top and bottom wing numbers?' To that, all the fighter pilots at Hq said, 'No, in an airplane looking down you have glare, or the rate of over-take is so fast the number goes under your wing before you can read it; if you go under and have to read up, you read the number backwards, and pilots don't like to be in a position right under an airplane.'

"So ADC, being open-minded, gave the project to Western Air Defense Force to work out. They asked that they take a C-47 and number it like a typical civilian aircraft, and run every conceivable type of intercept pattern on it. This they did—they ran every type of pattern they could dream up with an F-89, an F-86 and some F-94's, at the fast overtake, slow overtake, coordinated airspeed between two aircraft, etc. They then submitted a report that stated they were of the opinion that the tail number was the safest and most practical means of identification, and so they asked for bigger tail numbers. After CAB got the full report, it proposed a new rule requiring larger numbers. But following opposition from the industry, the new rule was deferred for further study. CAB, however, has authorized the use of larger numbers on the side of the fuselage. The plane owner is authorized to use them, but he does not have to."

Gen. Marriott: "*It isn't mandatory?*"

Jack Tighe: "No, but larger numbers certainly would help ADC as well as help stop the squawks. The Air Defense Command has stated to both CAA and CAB that it has no desire to come in close to intercept any aircraft, but it would appreciate cooperation on the part of civilian aircraft as well as other military aircraft in the use of these larger numbers. Larger numbers will keep the fighters at greater distances."

Jay Dettman: "We had a meeting with the ADC people and we asked if they would be satisfied with large individual airline serial numbers rather than NC numbers. A lot of carriers use their own three-digit numbering system, and ADC agreed to that. In that way the NC numbers could be kept small in size.

"All ADC is after is some means of identifying a given airplane. Many of the carriers are going to larger numbers on the tail fin, but not using the NC number."

Gen. Marriott: "*Mr. Womack, your company does a lot of work for private owners. Does this question of size of the numbers on the airplane come up?*"

Jack Womack: "Yes, I have talked to many of the business-plane pilots who have had their aircraft in for work at our facility, and Mr. Tighe is absolutely correct. Everyone wants the smallest numbers they can get on the tails of their airplanes."

Gen. Marriott: "*Well, what's the answer? Should we try to encourage larger numbers or should it be a matter of regulation? Apparently, the regulation is distasteful and the private owners don't relish the expense of repainting numbers on their aircraft.*"

Jack Womack: "If it makes a safer operation, larger numbers should be painted on the tail.

"I have been intercepted on a couple of occasions and it scared me as well as my passengers. It scared them to the extent that they came up and asked me about it. Since we aren't sitting on parachutes up there, I think it's a problem the private corporations owning aircraft ought to look into, particularly if they are mainly concerned with something fancy and no numbers at all!"

Jack Tighe: "Sometime ago we mooched some scotch-lite tape at headquarters and put numbers on the tail of a C-47; then we used a T-33 for a night interception. With normal C-47 Air Force numbering in scotch-lite, the navigation lights were enough to read the numbers at 300 feet. They reflected very nicely. With a two-cell flashlight and the fighter at 500 feet plus, the numbers showed up like a neon sign.

"We took the airplane to a totally dark part of the field and took some photographs. I think the photographer took them at 100, 300, 400, 500 and 1,000 feet, using a flashlight, and the pictures showed the numbers very well.

"This scotch-lite idea, by the way, was not original with us. We got it from *Flying Safety* magazine."

Gen. Marriott: "*Perhaps that offers some possibility for improvement in night identification, but I don't know how we're going to get everyone to put it on their aircraft.*"

Jack Womack: "Our company used it on one particular airplane, a B-17. Evidently, it was requested by the owner."

Gen. Marriott: "*Mr. Connick, will you tell us your experiences?*"

L. Preston Connick (*Chief Pilot—Western Div., Slick Airways*): "During the past year we have had only one intercept, and that was out near Palm Springs intersec-

(*Continued on page* 32)

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Round Table

(*Continued from page 30*)

tion. The crew stated it was normal and smooth. Later it was determined that our aircraft was on a flight plan and in the correct position. It all seemed to boil down to the fact that there had been a breakdown in communications somewhere between ARTC and Air Defense."

Gen. Marriott: *"Were you on time? I suppose you were on the cut-off from Prescott to Palm Springs intersection, which is quite a distance between reporting points."*

L. P. Connick: "That's right, but the airplane was on time and on course."

Gen. Marriott: *"What kind of a flight plan was it, IFR or DVFR?"*

L. P. Connick: "It was a DVFR flight plan. We made a position report on the south leg of the Needles range; we were 30 miles south of Needles when we gave them a new estimate for the ADIZ."

Gen. Marriott: *"Apparently there was some failure in communications."*

L. P. Connick: "I did receive a letter regarding the incident from the Air Defense people at Norton and they stated we were correct; there was a breakdown in communications."

Jay Dettman: "I'd like to make some comments on the reduction in the frequency of interceptions that we have experienced in the last year. Without a doubt, the 27th Air Division has followed a very progressive program. Most of the interceptions we have experienced were due to a lack of education somewhere along the line, from the cockpit on down to the controller in the flight information headquarters.

"Last fall we were invited to participate in a meeting at Norton during which, at the 27th Air Division's suggestion, we established a very informal procedure to pass the word immediately after there was a breakdown, an intercept or a scrambled aircraft recalled before an intercept, and it has worked to the mutual benefit of both the carriers and the Air Defense Division. Instead of a New York-based pilot being involved in an incident out here, going back to New York and then 10 days later getting a letter after he has forgotten all about the incident, now the chief pilot gets a phone call about the time the pilot arrives in Los Angeles and they discuss the matter immediately. If the airline pilot was at fault, he is given the word then and there, and if it was a breakdown in communications somewhere, the pilot is still there with all the facts fresh in his mind.

"As a result of this program, we have had a very definite decrease in interceptions since last fall.

"I would think it would be a good idea for other individual Air Defense Commands to follow a similar program."

Gen. Marriott: *"I understand there are some changes taking place in the ADIZ boundaries and in the rules which might help to improve the situation.*

"Major Sadek, are you familiar with the changes in the ADIZ boundaries?"

Major Sadek: "It probably would be better for me to state that we are working constantly on this problem. We want to solve the difficulties and improve the identification system as a whole."

Gen. Marriott: *"I just received a report through CAA channels that we are ready to adopt some changes which will become effective on Dec. 1."*

Jack Tighe: "The plans you are talking about concern the new ADIZ which CAA is designating at the request of the military. It has been in the mill for over a year.

"The CAA administrator and his representatives were shown the new plan several times last year, and the CAA was given the opportunity to make suggestions so it would be easier to sell to the industry. As it was originally proposed, it was a little tighter than we thought it should be, but after a lot of horse-trading, it was finally firmed up in September at the SCAT (Security Control of Air Traffic) Board meeting. This Board is involved with defense matters only, and is comprised of representatives of the Air Force, the CAA, the CAB, and the Navy. Several times a year, however, the industry representatives are brought in.

"The Administrator was asked to designate these changes effective December 1, 1955."

Gen. Marriott: *"I understand the changes will include a clarification of this airspeed business."*

Jack Tighe: "Yes, it's a tightening up in some areas, but it's a relaxation in others. To penetrate an ADIZ, you must be on a flight plan or be below 1500 feet and 110 knots. Anything within that speed and altitude range is considered friendly, flight plan or not, but anybody above that *must* be on a flight plan.

"To take the sting out of it, anybody who is not in a position or location to file a flight plan, that is, if no flight-plan filing facilities are available, a pilot is authorized to make a collect long-distance call to the nearest CAA facility and file his flight plan.

"We are making it easier for him to comply, U.S.-wide, and we think it offers more advantages than disadvantages to the private pilot."

Gen. Marriott: *"Actually, it will make it easier to fly here on the West Coast.*

"While you will have an ADIZ to go through to get in or out of this area, you will not have one right over the coastal states. Therefore, there will be more free flying in the area."

Jack Tighe: "You will be able to fly from San Diego to Seattle and not get into an ADIZ nor have to file a flight plan.

"I'd like to answer a question that Mr. Holtan brought up concerning the problem of an air carrier changing his route.

"Not long ago the CAA received a request for rule interpretation from one region. The question was, is an air carrier's air-filed flight plan change considered an air-file? The CAA advised its regions and said, 'We do not consider air-carrier changes as air-file flight plans. ADC got info copies of it, and objected.

"I pointed out to ADC that the air carriers follow their flights almost as closely as an ARTC Center does; they can call their pilots by name; have their own frequencies, etc. ADC finally was convinced that there was no risk in the air-carrier pilot calling his company's facilities and having the radio operator there call ARTC to report the change."

Gen. Marriott: *"When you speak of an air-file, are you talking about a file via radio from the aircraft in flight?"*

Jack Tighe: "That's right."

Gen. Marriott: *"Under those circumstances and with a little imagination, you can see that ADC could not be certain that the person giving the flight plan is actually representing the airplane he says he is. With a flight plan filed on the ground, you see the pilot and know the airplane."*

Jack Tighe: "I also pointed out that the military can tighten up on their own pilots to a point where a pilot who did not plan to penetrate but, due to weather or some other thing, decides to alter his flight, is required to land and ground-file. They will not accept a military air-file flight plan into an ADIZ. I mentioned it would be impractical for an air carrier with a load of passengers to have to land at some intermediate field or go back to a field he could get into, to ground-file his change."

Gen. Marriott: *"In all likelihood the program Mr. Dettman mentioned, of better dissemination of information and a clearer understanding of the regulations, will prevent some intercepts when the airplanes are on course and on time."*

Col. Pardue: "In that connection, I'd like to ask a question. Do you have any figures on how many intercepts are caused by ignorance of the rules?"

Jack Tighe: "I've never heard of any. That would be difficult to get because we would not know this unless we were investigating some pilot, and then only the investigator could tell you whether it was a violation or just ignorance on the part of the pilot. From talking to pilot groups, however, we feel most of it is ignorance."

Col. Jensen: "I'm inclined to agree, and that's why I'm all for these get-togethers between the military, the CAA, the airline people, business pilots, etc. Such meetings would be an excellent way of making known the pertinent rules and procedures."

Gen. Marriott: *"Is anybody prepared to tell what steps are being taken to publicize the modifications in the rules?"*

Jack Tighe: "The CAA representative who attended the SCAT Board meeting at Hamilton AFB yesterday said that the CAA was undertaking a big publicity campaign on these changes. Circulars will be available at all CAA facilities in the field and at the Communications stations, so when you go to file a flight plan, you will have a chart of the new layout and the rules. The circulars will go to airport managers, too. Certainly, the CAA will do everything possible to make the changes known to pilots.

"Pilot organizations also have been getting out advance notices to condition their pilot-members to the changes. AOPA, for example, has done a great deal, and AOPA also has put in a plea for all pilots to get two-way radio as soon as possible to make their flying easier and to make the ADIZ rules easier to comply with.

"This new ADIZ configuration touches on parts of the country never touched before and it's going to affect a lot of pilots who have never been exposed to ADIZ flying, in the Middle West, for example. It probably will take some time to get it to run smoothly."

Gen. Marriott: *"Then we do have a joint responsibility, between the ADC, the CAA,*

and the aircraft operators, to try to spread the word as soon as possible."

L. C. Holtan: "Mr. Tighe, you spoke of a new ADIZ area here in the west."

Jack Tighe: "Generally speaking, it is a strip running north and south, down through Spokane, Las Vegas, and on down to the Mexican border. It will leave all west of that, on up to the coastal ADIZ, a free area in which you will not have to file a flight plan insofar as defense requirements are concerned. However, you would have to file if you were making a westbound penetration of the Western ADIZ."

L. C. Holtan: "It sounds more complicated than ever."

Jack Tighe: "When you see it, I think you will realize it's simpler. Today, you have a backdoor ADIZ out here which you do not have on the East Coast. You have your Pacific ADIZ and one down in the mountain ranges to the East. You'll still have that ADIZ, but they have changed the dimensions somewhat.

"The requirements will be the same as they've been in the past: when you are coming into the Western ADIZ from the Middle West, you must be on a flight plan, make position reports, etc.

"On this new deal, you can fly through an ADIZ outbound, free. For example, let's say you are going to go from Los Angeles to Denver and not penetrate the Albuquerque ADIZ; under the new regulations no flight plan will be required out through that area. It will be, however, going inbound into it. The same thing applies on the East Coast. The Eastern ADIZ is a large area—the line comes down west of Minneapolis, west of Kansas City, south of Memphis and on down to Jacksonville. It isn't a deep ADIZ, however.

"Any operation, for example out of Memphis to New York, Chicago to New York, and all the heavy East Coast traffic area, Washington to New York, are free."

Gen. Shoop: "One thing we haven't mentioned is the good side of the system. In several cases the boys up there have been in a little trouble and they've been mighty happy to see some guy come in close to help them home."

Gen. Marriott: "*Before we conclude, I'd like to say that the CAA has had a program for a number of years to encourage pilots to file flight plans in the interest of their own safety.*"

Jack Tighe: "We've talked here of the hazards created by close proximity, but I've seen fighter-pilot affidavits come into headquarters over a period of years. I think they probably have had more complaints than have been received from civilian pilots.

"I've encountered as many and probably more fighter pilots who complain about the hazardous situations created by the evasive tactics of some civilian aircraft.

"A typical case involved an intercept that was unsuccessful. The civil aircraft was in violation but he was identified as friendly by the paint job. The intercept pilot said he attempted to close four times, but each time he came in, the civil aircraft turned into him!

"In another case of a legitimate intercept, a business DC-3 lowered his gear and flaps and slowed up so much he was just hanging in the air.

"ADC gets a lot of complaints on this lack of cooperation."

Col. Pardue: "At this point it would be a good idea to put on the record some of the things a pilot should *not* do when he is intercepted.

"We know that the most dangerous intercept is when you are intercepting a slow-flying aircraft and the interceptor pilot must catch the identification on the fly-by. He can't fly with the slow aircraft. Perhaps Col. Jensen or Major Sadek could tell us what a pilot should *not* do."

Col. Jensen: "We'd be very happy if the aircraft would continue flying its normal course. There have been occasions, fortunately not many, when an airplane on a night flight will turn off its lights when the interceptor starts coming in on him. That's very hazardous.

"And so is dropping the gear and flaps. With gear, flaps and everything else down, the interceptor's minimum approach speed is around 150 knots. To get down to the speed that a civilian aircraft could slow to is virtually impossible.

"Turning into an interceptor is dangerous, too. Perhaps in a few of those cases an aircraft was making a normal turn and the pilot just didn't know the interceptor was coming in. But if it was done deliberately, it's a bad practice and not conducive to flying safety. Actually, anything that will drastically change the course or speed of an aircraft being intercepted could create a dangerous situation, and so could anything that would change the visibility of the aircraft, such as turning off the lights."

Gen. Shoop: "One thing that may not be universally known is that in many cases the initial part of these interceptions is being made via radar approach, and this can become rather involved if aircraft go into evasive action."

Major Sadek: "We've been talking about the feelings of the pilot who is being intercepted, but we might give some consideration to the boy sitting in this machine making the intercept, doing everything by himself. He has a love of life and is just as interested in the safety of flight as are the people in the intercepted aircraft."

Gen. Marriott: "*We all agree that our defense system is essential and that it is necessary to intercept an airplane to see whether it is friendly or unfriendly. We all are interested in accomplishing the mission without any hazard to either aircraft, and we would like to see that the rules are properly established to accomplish this.*

"*The need to improve our communications has been indicated, and if we can improve that, we can help the system.*

"*Presumably, the study that has been given the ADIZ changes has been for the purpose of improving the efficiency of the system and the safety of it. Therefore, perhaps we can look forward to better operating conditions than we have had in the past. Certainly, it is all to the good and deserves everybody's cooperation.*

"*If there are no other comments, gentlemen, I'd like to thank you for participating in this discussion, and I'd like to thank SKYWAYS for giving us this opportunity to air our views. I am certain we agree that the meeting has been very worthwhile and will be useful to the pilots of military and civil aircraft.*"

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Report: Boeing 707

(*Continued from page 9*)

forces at low speeds for improved maneuverability and higher forces at high speeds where abrupt maneuvers are not wanted. Natural feel, without sluggishness or oversensitivity, is the end result.

The use of mid-span, high-speed ailerons supplemented by hydraulically operated spoilers and, when flaps are down, of outboard, low-speed ailerons, simplifies lateral control. Operation of the flaps adjusts the linkage between inboard and outboard ailerons, permitting outboard operation only with extended flaps. As Tex pointed out during our flights, this arrangement permits the airplane to develop a rolling rate—when flaps are up or down—considerably higher than that in a so-called conventional transport. He also said "that such lateral control will permit the aircraft to operate safely from airports with a 90° crosswind of 30 miles per hour."

The dual-reliability concept of safety also was paramount in the thinking which Boeing devoted to the 707. It is particularly noticeable in such essential areas as fuel and hydraulic systems.

For example, each engine has a normal fuel flow from its own tank, but two electric boost pumps in each tank provide dual reliability of fuel pressure. And, equally important, each pump is on its own electrical system. But if both electric pumps are lost, there is an engine-driven pump to feed fuel to the engine. In the event fuel is not available to an engine from its own tank, there is a manifold line which can draw fuel from any of the remaining tanks.

The two-system reliability also extends to hydraulic lines. Each engine has an engine-driven pump, supplying pressure to two independent hydraulic systems. Spoiler actuation, flaps, landing gear and nose-gear steering are divided between two hydraulic systems. Pilot brakes are on one and copilot brakes on the other. A manual cross-over valve makes it possible to transfer gear and flap functions from one system to the other.

Another important feature of the 707 is the isolation of engines from wing structure. Each engine is housed in a pod suspended from the wing, aiding greatly in the reduction of engine fire hazards. In addition to positioning engines outside wings, Boeing has made good use of fireproof materials, fire detectors, and good drainage of combustible fluids. In the event of a fire, a light is illuminated in the handle of the single fire switch (one for each engine) located prominently in front of the pilots.

One of the eye-popping features of the simplified 707 cockpit is the way engine instruments are oriented for fast, easy checks. On engine instruments having indicator needles, all are set so that during all normal operations all needles are parallel. All the pilot has to look for is a needle that is off parallel. How about that? And at no extra cost the pilot gets the 707's two-inch instruments mounted in 90 sq. in. of panel space, compared with 230 sq. in. in a four-engine propeller-driven aircraft.

One of the areas for intensive experimentation and development at Boeing is that of stopping such large jet transports as the 707, which will gross at least 120 tons. Current regulations do not permit credit for reverse thrust in demonstrating landing distance, but all users of the 707 and comparable jets insist on it and the search is on for the most effective reverser for the production airplane.

Knowing that the 707 was intended to operate from many existing airports, Boeing arrived at a design based on moderate wing and thrust loadings. They believe that, together, they contribute to the airplane's ability to demonstrate a marked increase in acceleration at take-off over conventional aircraft. Boeing feels this increase in acceleration can be converted into an increased rate or angle of climb at the option of the pilot. This would indicate that jet transport take-off characteristics should be superior to that of piston-engine transports if the pilots will adapt themselves to utilizing this increase in aerodynamic performance.

It also is important to note that, with proper wing and power loadings contributing to improved take-off performance, jet transports of the 707 Class should have greater enroute climb ability on two engines. Also, they should be able to maintain this advantage over a broad speed range.

It is true, of course, that the 707 has a conservative wing loading which permits approach and landing speeds very close to those of advanced reciprocating-engine aircraft. And it is true that, without reverse thrust, the landing field length difference between jet and piston-engine transports is essentially the result of windmilling propeller drag during rollout. However, the absence of such drag on a jet is somewhat compensated for by the use of speed brakes on final approach and at touchdown.

The eight-wheel bogie main gear of the 707 provides large footprint area for good braking and that braking's effectiveness is increased by the use of speed brakes for fast unloading of the wing after touchdown.

Fairly complete design studies have shown that the 707 is a well-balanced jet transport and that it should be able to land and stop in about the same distance as present transports on a dry runway. However, it will be required to operate during all types of weather and runway conditions and a stopping device, such as a reverser, will be necessary to make this "all weather" operation possible.

So, Boeing has been experimenting with several thrust reverser configurations, such as the half spherical "W", the conical "V" umbrella, the logitudinal "V" gutter, the half spherical "U" and the clamshell "W" in an attempt to settle on one installation that will provide "fail-safe" operation and operational flexibility of the type enjoyed by reversible-propeller aircraft. One or more reversers will probably be available.

The external noise of four-engine jet aircraft in the 707 Class poses a real problem, just as does the noise of reciprocating-engine aircraft, and both must be controlled within acceptable limits, particularly where densely populated areas are located close to busy airports.

This problem has been a cause of major concern to major airport operators for some time and was emphasized in the statement issued by the Chairman of the Port Authority, Donald V. Lowe, when asked by the press for comment on the announcement in November that Boeing had sold the 707 to Pan American:

"The Port Authority assumes that Pan American would require from the manufacturers specifications which would assure that these aircraft could operate to and from New York International Airport without excessive noise characteristics that would be intolerable to the airport's neighbors. If Pan American has such assurances, the Port Authority, of course, is delighted that this airline has been able to effect this forward step in the progress of air transportation.

"On July 12, 1951, our Board adopted a resolution in which it stated 'No jet aircraft may land or take off at an air terminal without permission.'

"On September 16, 1952, we said: 'It would be just as useless to design planes that cannot be operated into and out of metropolitan airports because of excessive noise or performance characteristics, as it would be to design planes that cannot fly. Aircraft manufacturers have solved most of the problems related to safety, efficiency and speed of their planes. They must and they will solve these new challenges.'

"The Port Authority's position has not changed."

As an airport operator, the Port Authority welcomes such great strides in air transportation as the development of high-speed transports. We believe the commercial use of jets is most desirable, but the problem of jet noise *must* be solved before this development can bear fruit. In its present configuration, the 707 (like most military multi-jet planes) displays noise characteristics well in excess of what can be considered a sound level tolerable to the public.

Boeing and others are conducting studies of jet-aircraft noise and methods of suppressing it and I had an opportunity in Seattle to sit down with a group of engineers for a discussion of their findings and some of the problems to be faced when these aircraft become operational. In the group were Otto Kirchner, Art Curren, Rolland Curtiss, Bill Jensen, V. Proven, H. W. Smith, and J. E. Steiner.

These men have made extensive studies of noise and I believe they are aware that it will be a real problem unless steps are taken in advance to reduce the noise to a level that will not be intolerable to the airports' neighbors. Like reciprocating-engine aircraft, jet transports will use maximum power for take-off, and noise becomes a problem during and after take-off run. However, once a jet is airborne it may be possible to use its greater angle of climb and greater rate of climb to reduce the period when noise levels are high.

The ground noise problem is also serious and Boeing is doing considerable research in controlling jet-engine exhaust and has designed a fence to break up the jet blast behind the airplane. However, this is not essentially for noise suppression. Another gadget for their aircraft was an individual silencer behind each dual-pod nacelle. Water introduced into the outlet passage absorbed energy but created a problem of what to do with water vapor. For full power operation on more than one engine nacelle, Boeing built a multiple sound suppressor for the B-52. It proved to be very expensive and not efficient for airline use.

It is Boeing's conclusion that for low-

power engine run-ups only the blast fence needs to be employed. For prolonged full-power engine run-ups, a portable silencer, when developed, will serve for ground maintenance run-ups. In day-to-day airline operations, Boeing believes that silencers would be required only at overhaul bases.

Airlines and manufacturers of aircraft and engines are cognizant of the problem and are devoting considerable time, money and effort in research of the subject.

Tex Johnston, in briefing me before take-off, emphasized that take-off, climb-out and cruise conditions were normal, and he was right. And I found out for myself that pilot duties are considerably reduced because of the simplicity of cockpit and engine controls. Can you imagine being told to "climb this giant and glamorous hunk of aluminum from take-off to 35,000 at 300 knots indicated?" That is faster than any large commercial transport flies today in level flight.

The stall is honest, with a clean airplane or with flaps down, starting with a slight tremor at 10 to 12 knots above the stall and, of course, increasing as the plane is decelerated. Directional and lateral control can be maintained throughout the stall. At transonic speeds, there was no indication of buffeting or flutter.

The 707 can make descents at well over 10,000 feet per minute from altitude to deck. In fact, in a high-drag configuration, the 707 can descend faster than any multi-engine aircraft I have flown since I ran a series of high-altitude descents on a C-54 in 1947 in which I reversed all four props simultaneously to obtain the above rates.

The almost complete absence of vibration and the low level of engine noise are, in a word, delightful to pilot ears conditioned to the beat of piston engines. About the only noise the pilot hears is a slight whine from the turbines and the sound of air whistling over the nose structure of the plane. I said "about the only noise." But those fuel counters just have to go. They just sit there and go click, click, click—like a taxicab meter or a pair of castanets, only much louder. If the counter is ever to be standard equipment, its manufacturer will have to make it noiseless, or have it play a soothing melody for the poor old pilot.

Visibility is better than average in such large aircraft. It is helped by four windows in the roof of the cockpit, two above the pilot and two above the copilot. Forward and side visibility also are good. But however excellent visibility from a cockpit may be, in this age of jets the "see and be seen" type of flying is rapidly diminishing. Higher cruising speeds bring with them higher rates of closure and this, it seems to me, must eventually bring about complete air traffic control, particularly in all high-density areas.

Ralph L. Bell, director of Boeing sales, reports that performance of the prototype has proved that the 707 *Jet Stratoliner* will have a direct operating cost well below that of conventional four-engine aircraft at virtually all ranges beyond 500 miles. This is good news for passengers, as well as for the operators, because it makes it possible to integrate jet range, speed and comfort into the present airlines economic structure without creating a noticeable bulge.

Measuring 707 performance capacities against those of a standard four-engine transport now operating, Bell found that the 707 holds a firm edge. The 707 provides standard-width seating and aisle for 103 passengers (130 air coach), as against 58 to 60 in the DC-6B and DC-7 and 67 in the *Super-Constellation*. He reports that the work rate—number of seats multiplied by average speed—is about three and one-half times greater for the 707.

But the most important element of operating economy is that of speed. On the non-stop San Francisco-New York run, the 707 can leave the West Coast at 8 a.m., PST, and arrive in New York at 4 p.m., EST. The same aircraft can then leave New York at 7 p.m. EST and land in San Francisco at 9:37 p.m. PST. Another departure can be made from San Francisco at 12:40 a.m., arriving in New York at 8 a.m. EST. That would be three transcontinental flights in less than 22 hours elapsed time.

To the passenger, this provides eastbound flight time of five hours and westbound flight time of five hours, 37 minutes. To the airline, this is a high degree of utilization for a large-capacity aircraft. Bell reports that, even with stops at Denver, Chicago and Cleveland, the 707 would record a comfortable operating cost advantage over the fastest present-day transports and some advantage over shorter-range types.

He explained that the simplicity of the 707 engines will be a big factor in reducing ground delay. They will bring about a big reduction in the total delay time always charged to powerplants.

And in this connection, the only logical way to obtain large increases in speed with jets is to fly them at high altitudes. The 707 will operate at altitudes between 25,000 and 40,000 feet, flying above the weather and, of course, above any terrain obstacles. And with so much to gain by flying high, Boeing has taken extra pains with its pressurization system and with structural safety and endurance. Structural design of the 707 is based on long Boeing experience with high-altitude flight and pressurization. Strength that distributes pressure loads and inhibits spread of damage are built in.

All fittings of the 707 have been adapted to the requirements of high altitudes. There are many small, rather than a few large, windows, because Boeing decided that loss of a single window of the size used in conventional pressurized aircraft would result in depressurization within 12 seconds. The 7¼ x 11-inch window in the 707 would, if lost, result in complete pressure loss only after 70 seconds. All openings, doors and hatches, are designed for inward-opening. They are plug-type openings held in place by cabin pressure as well as by locks.

All of these things add up to more comfort for passengers. Speed alone will be only part of the service jet transports will offer. Most air travelers know the irritation created by piston-engine beat and by propellers. With turbojet engines, such as the P&W J57's on the 707, the cause of this vibration is eliminated. They contain no reciprocating parts and, of course, the propeller is eliminated. The result is power developed as thrust.

It is impossible, I believe, to explain in words the performance difference between travel in a jet transport and one powered

(*Continued on page 40*)

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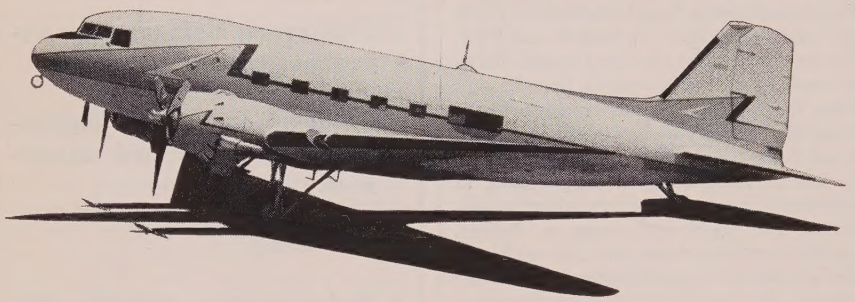

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Customer Airlifts

(*Continued from page* 11)

full day's productive work out of high-salaried management people which might easily be lost if they traveled by commercial plane to a certain city and then changed to other forms of transportation."

Many other instances can be cited to prove the intrinsic value of Harvester's company-owned aircraft, ranging from rush cargo deliveries to getting the jump on a competitor who has to wait for a scheduled departure time or for seat space on a commercial airline. These company trips can be arranged in such a way as to avoid necessity for passengers being away from home overnight, thereby reducing cost of the trip through elimination of hotel bills and related expenses.

Harvester considers its four airplanes to be essential tools of business (just like a tractor is to a farmer), especially in the saving of travel time and in the ease with which sales, engineering, and manufacturing personnel can be swiftly moved to out-of-the way places off the commercial airline routes where much of the basic development work in farm and industrial equipment is carried on.

While some firms operating aircraft still think in terms of "the President's plane," or limit the use to top management personnel, Harvester considers its planes as being available for any legitimate company purpose that cannot be fulfilled by other commercial transportation. Priority for the use of the planes is largely determined by the nature and importance of the trip rather than the official rank of the individual requesting the use of the plane. Every effort also is made by the Traffic Department to arrange for the travel of other personnel in the company planes at the same time, if schedules permit and seat space is available.

Although there was an understandable initial reluctance on the part of some Harvester employees to travel by company plane, this hesitancy soon was replaced by enthusiastic acceptance, especially after a policy decision was made to instill confidence in the passengers by inviting them into the cockpit area sometime during a trip to observe the enroute flight activities.

Harvester's aircraft operations are under the direct supervision of Gerard J. Eger, secretary of the company who also is a member of NBAA's Board of Directors and the Association's Treasurer. Chief Pilot, Wilfred R. Dotter and Captain Raoul Castro, former Military Air Transport Service pilots, are professionally qualified and experienced to fly anywhere in the world on a few hours' notice. In addition, Harvester has three other staff pilots, one copilot, and three copilot/mechanics.

Recently, Eger forwarded an impressive sidelight on the operation of just one Harvester DC-3. He said, "Captain Raoul Castro of N 24 H passed along to me information to the effect that during a 23-day period his airplane was flown 90 hours, covered 127,689 passenger miles and 15,331 plane miles with a load factor of 8.4 passengers per trip." Until challenged, Eger is convinced that this is an outstanding record, not only for Harvester but for all business flying. Certainly, it is undisputed proof that the company is getting maximum utilization from its aircraft.

Harvester has a practical and sympathetic viewpoint toward improved ground maintenance and better aircraft equipment. No reasonable expense is spared for safe and efficient flight operations. Consideration also is carefully given to a continuous program of progressive, preventive maintenance, thus avoiding long and costly major overhaul lay-ups and resulting idle time. Aircraft operations are budgeted and administered like any other company operation. Monthly expense reports are thoroughly analyzed to determine better and less expensive methods of operation. For bookkeeping purposes, all departments are charged the regular commercial airline rates when they use the company planes.

Like many other business plane owners and operators, Harvester is continuously studying the aviation industry's progress toward the development of a reasonably priced, dependable, pressurized multi-engine transport that can carry 8 to 12 passengers up to 1600 miles non-stop at 300 mph.

With new high-speed, high-altitude piston-engine DC-7's and *Super-Constellations* as well as turboprop *Viscounts* being used by the commercial airlines, the corporate executive will not much longer be satisfied to travel at fewer miles per hour across the nation. When such a multi-engine business plane is ready for sale, through either the development of a wholly new aircraft or through a major modification of a tried and proved existing plane, there is no doubt that it will greatly interest many progressive corporations which have found in the postwar business-flying phenomenon a valuable tool for providing better service to that most important source of revenue—the customer.

Report: Boeing 707

(*Continued from page* 35)

by piston engines. The traveler will have to board a jet and observe first hand what it is like to cruise at 550 mph or more.

In the 707 at cruise speed, the sound audible to the passenger is a faint whistling of the airplane moving through the air. The engine sound, heard only in the aft portion of the cabin, is a low-toned note. He gets none of the pulsing, throbbing turbulent air lashing against the fuselage from propeller action.

Also, passengers on the 707 will find only a slight, springy motion even in turbulent air at take-off or approach in hot or stormy weather. It rides mountain turbulence in a manner that seems to minimize the normal jolts found in rough air.

The 707 wing, which is swept for other reasons has inherent aeroelastic characteristics which combine with sweep to reduce the effect of gusts on wing loading. Upon striking the gust, the wind bends along its elastic axis, causing effective washout of the wing tips. This washout relieves the loading and reduces wing bending to minimize the effect of the gust. Thus, wing sweep, which contributes to the aircraft's ability to achieve high cruising speeds, provides inherent automatic compensation for this anticipated hazard of high-speed flight.

In early October, the Boeing 707 gave a convincing demonstration of what air travel in the turbojet transport age will be like. With Tex Johnston at the controls and R. L. (Dix) Loesch as copilot, the swept-wing aircraft averaged 550 mph at 35,000 feet on a 3,038-mile non-stop test flight. On the 1,030-mile leg from Seattle to Denver, its time was one hour and 44 minutes and average speed was 594 mph. These performances will become routine and will be bettered after the 707 becomes operational. What happened in October demonstrates just how routine.

At 4:45 a.m. one morning, the 707 left Seattle with Tex Johnston at the controls and climbed to 35,000 feet for a fast trip to Washington, D. C. Just three hours and 58 minutes later, the big transport flashed over Washington National Airport. It was a 2,340-mile flight at an average speed of 592 mph. And it was done at normal cruising power. On one leg—the 564-mile segment between Rapid City, S. D., and Kansas City—Tex clocked the 707 at 662 mph.

The integration of 707 Class transports, with their higher cruising speeds and higher altitudes, into air routes and traffic patterns with slow aircraft will pose some problems, but solutions by CAA and other responsible agencies are anticipated before the turbojets are introduced.

The 707 and its contemporaries in the new generation of jet transports are expected to deliver their operators greater economy than present transports on the same routes using some of the same airports. And they are expected to improve the currently high operating safety standards of the air transport industry.

Having had an opportunity to fly almost every type of aircraft, from *Cubs* to jet fighters, I can report that, after flying the 707, it generated in me a feeling of complete confidence and reliability. Its performance is superb. For the airline pilot, the 707 marks a new, brighter era—something he has dreamed about.

Having played a small part for the past 25 years in this flying business, I feel that we can all be very proud of the foresight and ingenuity of the great leaders of our aircraft industry. Their leadership will always keep our U.S.A. strong.

---

707 SPECIFICATIONS

Wing Span	*130 ft. 10 in.*
Length	*134 ft. 6 in.*
Height	*38 ft. 3 in.*
Gross Weight	*230,000 lbs plus*
Power	*4 P&W J57's, each rated at more than 10,000 lbs thrust*
Speed (cruising)	*Above 550 mph*
Cruising Altitude	*25,000 to 40,000*
Range	*Non-stop transcontinental, non-stop trans-Atlantic*
Landing Gear	*Tricycle*
Crew	*Pilot, copilot, engineer*